AD-A110 062 ICI AMERICAS INC VALLEY FORGE PA F/G 19/1
DEVELOPMENT OF A 0.01-S DELAY, STAB-INITIATED PRIMER.(U)
DEC 81 J H EVANS DAAK21-79-C-0113

UNCLASSIFIED HDL-CR-81-113-1 NL

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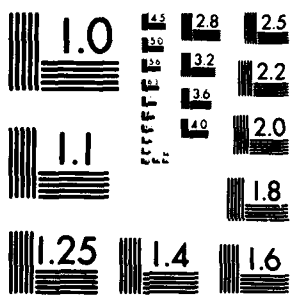

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

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HDL-CR-81-113-1

December 1981

LEVEL II

Development of a 0.01-s Delay, Stab-Initiated Primer

John H. Evans

Prepared by

ICI Americas, Inc.
Valley Forge, PA 19482

Under contract
DAAK21-79C-0113

U.S. Army Electronics Research
and Development Command
Harry Diamond Laboratories
Adelphi, MD 20783

412061

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412061

20. ABSTRACT (Continue on reverse side if necessary and identify by block number):

This report describes the design and development testing of a stab initiated delay primer for ordnance application. Its initiation sensitivity is .75 in-oz, delay time is nominally 10 ms, output is 27mg of RD 1333, and its overall size is .16 diameter by .30 long. 650 primers were built and results of shock, temperature, and confinement variable tests on 500 units are presented. Mean function time ranged from about 9 to 12 ms over the temp range of -65F to +160F and the sigma ranged from about 1 to 2 ms. The final design is rugged, reliable, and simple to produce.

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Unclassified

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1. INTRODUCTION

Our contract with Harry Diamond Laboratories began in September 1979. It called for the development and pilot lot production of a 0.01-s delay, stab-initiated primer ("stab delay primer") in a package of 0.160-in. diameter by 0.30-in. long. Drawings of this device are shown in appendix A. The primer design is based upon the 0.10-s stab delay primer currently in production for the M734 Multi-Option 60-mm mortar fuze. The assembly drawing of this primer and the assembly drawing of its output cup are shown in appendix B. All other drawings are the same as the 0.01-s device.

2. DEVELOPMENT EFFORT

The original design concept for the 0.01-s primer was to use the same parts that existed for the 0.1-s primer and change the delay powder from boron-barium chromate to zirconium-iron oxide and diatomaceous earth (A1A). Devices were built and tested, but the delay times were too long, being about 0.04-s.

We attempted to reduce this time by decreasing the length of the A1A delay column. Since the length of the output housing is fixed, the length of the lead azide charge had to be increased. Devices were built and tested and many fast function times (instants) resulted.

We felt these instants were caused by having the lead azide too close to the input charge. Primers were built and tested with a spacer in the output assembly which moved the lead azide back to its original position and kept the short A1A column required for the proper time. With this design many duds resulted.

If the delay powder was too far from the input charge, duds resulted; if the lead azide was too close to the input charge, instants resulted. We decided to replace the output cup with a heavy-walled machined part. This would give better mechanical support to the lead azide and allow closer placement of it to the input charge to eliminate the dud problem. Stainless-steel output cups were tried, but many instants resulted. We then switched to aluminum cups and test results were significantly improved. The dud and instant problems were still present, but we found that these could be eliminated by increasing the cup bottom thickness and controlling the air gap getween the input charge and the top of the delay column.

The cup as shown in appendix A gave good support, yet the bottom was easily blown out by the lead azide charge. If the air gap was greater than 0.06-in., duds resulted; if it was less then 0.02-in., instants resulted. The gap is controlled at 0.03 to 0.045-in.

The final design is shown in appendix A. The Housing, Input Cup Assembly, and Baffel Screen are the same parts as are in the 0.1-s design. The Output Cup Assembly is not the same. It consists of a machined aluminum cup which contains the lead azide output charge and the A1A delay column. The lead azide charge is 27 mg versus 17 mg for the 0.1-s design.

This increase was necessary to meet the delay column height requirements for the 0.01-s delay time and also to meet the air gap requirements. The AlA charge is 9 mg.

2.1 Preproduction of Primer

A total of 137 primers were built to the design of appendix A and tested using the test fixture shown in appendix C. The tests were conducted at +150°F, 70°F, and -65°F. The detailed test results are shown in appendix D and a summary is shown in table 1.

The first group of 25 primers had slow times and the AlA charge weight was reduced to 9 mg from 11 mg for the balance of the devices. All times except one were within specification (0.005 to 0.015-s) and there were no duds or instants.

TABLE 1. SUMMARY: PREPRODUCTION TESTS

Test condition (°F)	Quantity	Mean (m-s)	Standard deviation (m-s)
70	25	12.32	1.62
70	10	10.82	1.67
-65	40	11.99	1.89
150	40	11.19	1.59
70	22	11.51	1.18

2.2 Pilot Lot Primers

A total of 500 primers were built to the drawings of appendix A for the pilot lot. One hundred and fifty of these were selected for testing. Fifty were functioned at +150°F, 50 were functioned at -65°F, and 50 were functioned at 70°F. The 70°F units were functioned after being subjected to the following shock pulses (required by the specifications):

> The primer will be subjected to two (2) consecutive triangular shock pulses, each of 10,000 ± 2000 g peak amplitude and approximately 1.0 millisecond total pulse wdith. The two (2) pulses will be applied axially. The acceleration vector of the first pulse will be directed from the stab end of the primer toward its output end. The acceleration vector of the second pulse will be in the reverse direction.
>
> The primer will be subjected to the same shock test as above but at a peak amplitude pulse level of 40,000 g max.

The test samples were inspected and tested in accordance with the ICI procedure shown in appendix E. The testing was performed at the ICI plant in Tamaqua, PA, and the test fixture was essentially the same as is shown in appendix C. With the Tamaqua fixture, the drop weight is allowed to exit from the guide tube before it contacts the firing pin. At the Valley Forge plant, the drop weight did not exit from the guide tube before contacting the firing pin. The significance of this difference will be discussed in section 2.3.

The detailed test results are shown in appendix F and summarized in table 2. The results were not within specification, the times were long, and a total of 9 duds resulted. We assumed that a design flaw existed and began to consider new design approaches.

TABLE 2. SUMMARY: PILOT LOT TESTS

Test condition (^oF)	Quantity	Mean (m-s)	Standard deviation (m-s)
70*	50 (4 duds)	14.44	2.97
65	50 (3 duds)	15.09	3.18
150	50 (2 duds)	14.20	2.62

*25 were subjected to a 10,000-g triangular shock pulse.
25 were subjected to a 40,000-g triangular shock pulse.

2.3 Continued Development

Many new design approaches were considered and those that appeared to be the most promising were built and tested.

Four groups of primers were built with varying charge weight and density of the output charge of the input cup assembly. In all groups but one, duds resulted, and long delay times resulted in the group with no duds. As a result it was decided to remain with the standard input cup assembly.

Other tests were run where a flash charge of $Ti/KClO_4$ was added on top of the delay column. This charge was not pressed, but lightly consolidated with the insertion of the input cup assembly. This charge was added to provide easier ignition of the delay column and to help cushion the output shock of the input primer assembly. We had initial success but additional testing exhibited a severe instant problem.

At this point we decided to investigate the test method and discovered the difference in the test methods versus test location as

mentioned in the Pilot Lot section (2.2) of the report. Given this difference, we decided that the Valley Forge test method would confine the primer more and thus prevent the output of the input charge from exiting out the top of the primer. This would force the flame at the delay column and thus provide better ignition.

2.4 Survey Tests

An additional 50 primers were selected at random from the Pilot Lot. These were tested at Valley Forge with the Valley Forge fixture and test procedure. All tests were at 70°F and no duds, or instants resulted. The times were much more like the preproduction tests rather than the pilot lot tests. In addition, three other tests of varying degrees of confinement were run with small samples from the pilot lot primers. The detailed test results are shown in appendix G and summarized in table 3. These tests did show that the delay times were a function of test method.

TABLE 3. SUMMARY: SURVEY TEST RESULTS

Test condition (°F)	Quantity	Mean (m-s)	Standard deviation (m-s)
70 (samples from pilot lot)	50	12.40	1.74
70[1]	10	10.25	1.03
70[2]	5	8.45	1.39
70[3]	5	12.31	2.30

[1]Highly confined--firing pin weight remained in guide tube.
[2]Little confinement--firing pin weight exists from guide tube.
[3]Little confinement--to simulate the Tamaqua test method.

2.5 Confinement Test Program

As a result of the survey tests, it was decided to select an additional 130 primers for a confinement test program.

2.5.1 Test Program

The 130 primers were divided into seven test groups and a group of five spares. These groups were designed to investigate the effects of confinement, firing pin penetration, test fixture type, and temperature. The test groups are described as follows:

(a) 15 units at $-65^{o}F$ in HDL test fixture designed to simulate the SHAWL fuze.

(b) 15 units at $70^{o}F$ in same test fixture.

(c) 15 units at $160^{o}F$ in same test fixture.

(d) 20 units at $70^{o}F$ in ICI drop test fixture with <u>maximum</u> input confinement and firing pin penetration controlled to <u>0.02-in.</u>

(e) 20 units at $70^{o}F$ in ICI drop test fixture with <u>minimum</u> input confinement and firing pin penetration controlled to <u>0.02-in.</u>

(f) 20 units at $70^{o}F$ in ICI drop test fixture with <u>maximum</u> input confinement and firing pin penetration controlled to <u>0.06-in.</u>

(g) 20 units at $70^{o}F$ in ICI drop test fixture with <u>minimum</u> input confinement and firing pin penetration controlled to <u>0.06-in.</u>

2.5.2 <u>Test Fixtures</u>

A drawing of the HDL fixture is shown in appendix H. In this fixture, a 6.6-lb weight is dropped on a firing pin, shearing a safety wire, and driving the pin into the primer. The firing pin point diameter was 0.015-in. and the depth of penetration was 0.04-in. The heavy drop-weight represents 1300 times the weight of the normal fuze firing pin. Although this is only 5 to 20% of the force created by deceleration of the firing pin at target impact, it did provide a much higher degree of input confinement than normally encountered in laboratory tests.

The ICI fixture is shown in appendix I (drawing D-8291). A 337-gram weight was dropped on a conventional 0.03-diam firing needle having a 26^{o}, 0.005-diam flat point. The needle is guided by a steel cover over the primer. This cover has provision for a replaceable plastic guide sleeve that can be placed over the primer to confine back-blast from its initiation. The firing needle passed through a close-fitting hole in the block. The block is omitted for the "unconfined" tests. Firing pin penetration is controlled by a precision machined shoulder pin used to drive the firing needle. It would shoulder-out on the steel guide-block after the correct penetration. The details of each test set-up are shown as sections A, B, C, and D of drawing D-8291 (appendix I).

2.5.3 <u>Instrumentation</u>

Instrumentation for the time measurements was by means of a piezoelectric accelerometer rigidly attached to the metal test fixture structure. Output of the accelerometer was monitored directly by a dig-

ital storage oscilloscope. The "sound" produced by the primer's input and output charges functioning could be "heard/seen" on the scope trace, and the function time was determined with a resolution of 50 μs.

2.5.4 Test Results

The test data sheets and statistical calculations for the 125 primers are shown in appendix J. A summary of the test results is shown in figure 1. This figure contains the mean function time and standard deviation for each test group and a histogram for each group all aligned to the same time scale.

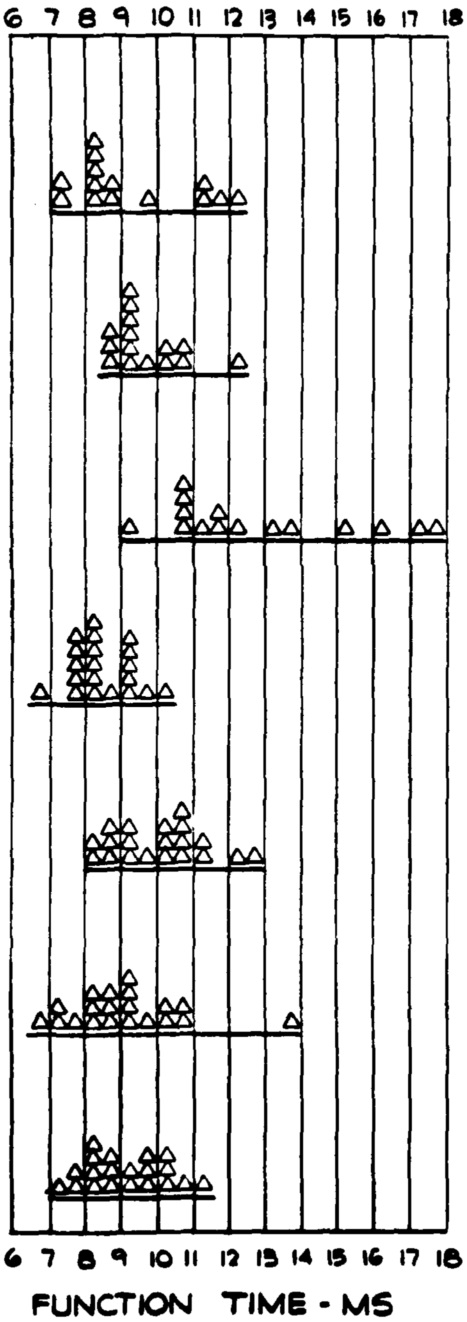
2.5.5 Discussion

Results for the ICI fixture show that confinement made a difference for the 0.02 firing pin penetration, with high confinement giving shorter function times by roughly 15%. When firing pin penetration was increased to 0.06, there was no apparent difference in function time due to differences in confinement. The average times for both confinements were in between those obtained for the 0.02 penetration case.

Results with the fuze fixture show the expected dependence on temperatures; hot--fast, cold--slow. The ambient results most closely match the unconfined cases with the ICI fixtures. This may be due to the fact that a pressure of only 150 PSI is needed on the wide face of the fuze firing pin in order to lift the heavy drop weight. Pressure created by the input charge function is expected to be much greater than this so the firing pin probably moved back and considerably relieved the confining pressure before the 10-ms delay was completely burned.

Although the results obtained in these tests show that the degree of primer input confinement and firing pin penetration obtained in an actual fuze configuration can make a difference in performance, they do not entirely explain the large differences in results obtained in preliminary testing with different fixtures. Some of these differences must be attributed to unresolved differences in instrumentation or test technique, or perhaps to the usual inconsistency of small sample statistics.

With HDL test fixture, two failures occurred (failure to initiate the input mix). One primer was replaced (-65°F) and the second was not (+165°F). The failures were attributed to the heavy shear wire used in the test fixture which considerably reduced the velocity of the drop weight. This result would be expected when the NOL 130 input explosive mix is punctured at a very low velocity. No such input duds occurred in over 450 tests that have been run on the same primers when using a higher velocity impact in a different fixture.



	Number	Mean	Standard Deviation
Fuze Fixture +160°F	14	9.226	1.658
Fuze Fixture 70°F	15	9.706	0.946
Fuze Fixture -65°F	15	12.825	2.652
ICI Fixture Max Confinement/0.02 Penetration	20	8.514	0.823
ICI Fixture Min Confinement/0.02 Penetration	20	10.059	1.259
ICI Fixture Max Confinement/0.06 Penetration	20	9.131	1.576
ICI Fixture Min Confinement/0.06 Penetration	20	9.116	1.049

ALL ICI AT 70°F

FIGURE 1. SUMMARY OF CONFINEMENT TESTS

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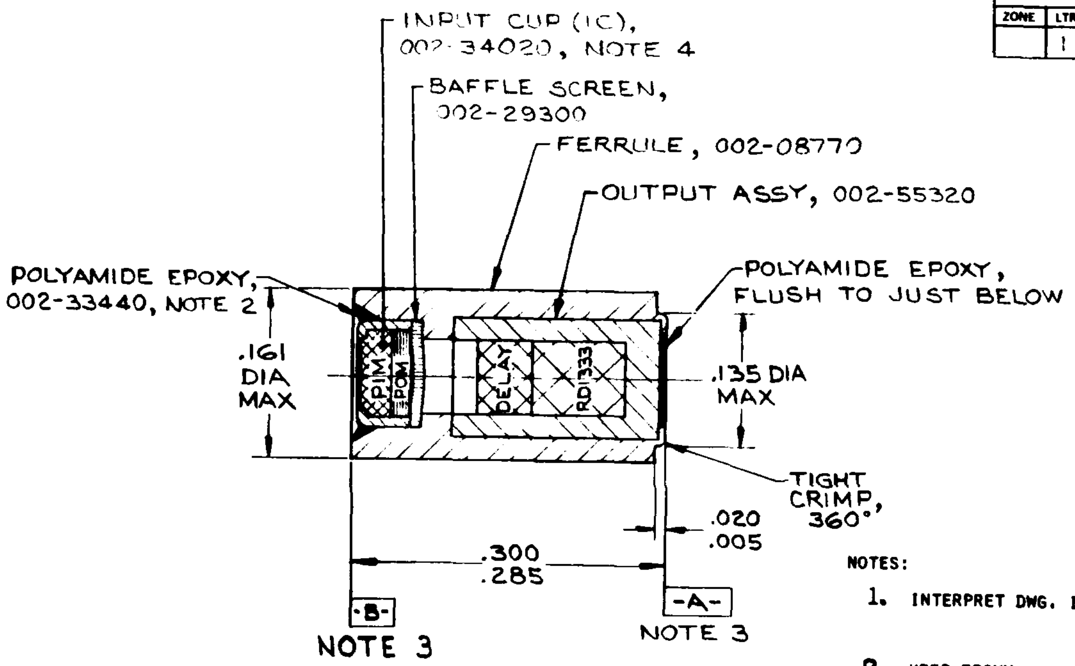
APPENDIX A.--0.01-S STAB DELAY PRIMER DRAWINGS



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	1	REV PER ECN 20455	7/1/80	

NOTES:

1. INTERPRET DWG. IN ACCORDANCE WITH MIL-D-1000.
2. KEEP EPOXY OFF SURFACE -A- & -B-
3. INPUT CUP TO BE *L.P.F. TO INSURE EPOXY DOES NOT FILL BAFFLE SCREEN. INSERT .005" ABOVE TO .012" BELOW FLUSH.

* L.P.F. : LIGHT PRESS FIT

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:
FRACTIONS DECIMALS ANGLES
± .XX ± ±
.XXX ±
MATERIAL
FINISH
DO NOT SCALE DRAWING

CONTRACT NO.	
APPROVALS	DATE
DRAWN FCB	3/11/80
CHECKED JWE	3/11/80

ICI Americas Inc.
Valley Forge, PA 19482

STAB DELAY PRIMER ASSY.
.01 SECOND

SIZE	CODE IDENT NO.	DRAWING NO.
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SCALE 10/1		SHEET 1 OF 1

NO.	REVISIONS	DATE

TYPE OF CERTIFICATION
QUALITATIVE ✓
QUANTITATIVE
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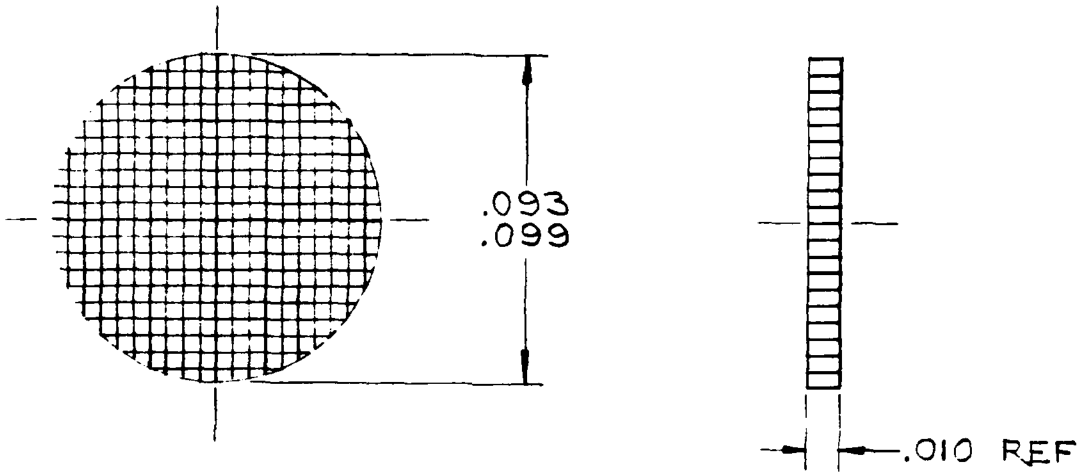
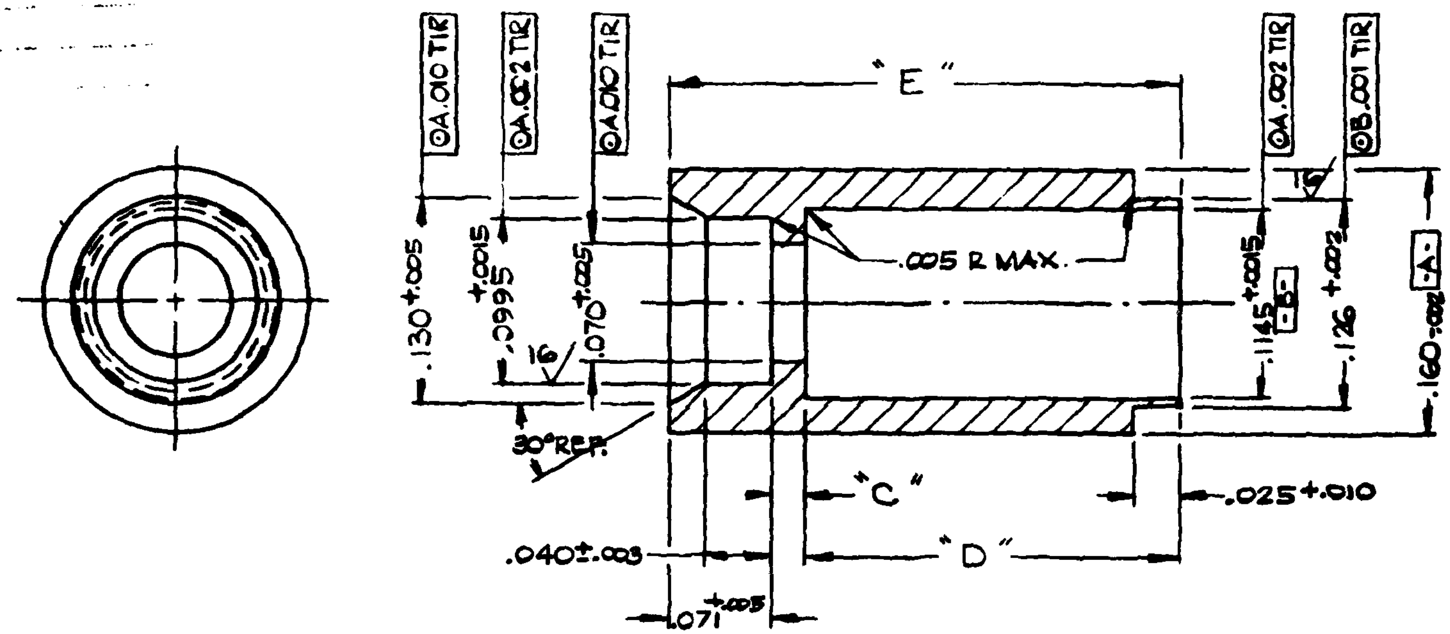


NOTES:
1. PARTS SHALL BE DIE CUT & FREE OF EXCESSIVE RAGGED EDGES, BURRS, & SLIVERS.

MAT'L: 100 MESH STAINLESS STEEL, .010 THK		SCALE 20/1	BAFFLE SCREEN
		DRAWN BY FCB	
		CHECKER	
TOLERANCES .XX±~ .XXX±~ ANGLES±~ FINISH IN MICROINCHES		PROJECT ENG. WELKER	ATLAS AEROSPACE DIVISION ICI United States Inc. Valley Forge, PA
		APPROVED BY	
	176-00060	APPROVED BY	
	NEXT ASSY.	DATE 3-6-75	SHEET 1 OF 1 — NO. 002-29300



NOTES:
1. REMOVE BURRS & SHARP EDGES .005 R MAX.
2. EXCEPT AS NOTED, FINISH 63

PART NO.	"C"	"D"	"E"	USED ON
002-08770	.020 ± .002	.215 +.005 −.000	.318 MAX	SDP
002-08771	.035 ± .002	.238 +.005 −.000	.356 MAX	SDD

& DET.

REV.	ECN.	DATE	APPROVED
3	16779	10-14-76	RJW
2	16483	6-16-75	RJW
1	—	11-8-74	DGS

REVISIONS

MAT'L: ALUMINUM 2024-T4

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES
FRACTIONS ± — ANGLES ± 5°
DECIMALS ± .005
FINISH IS IN MICROINCHES

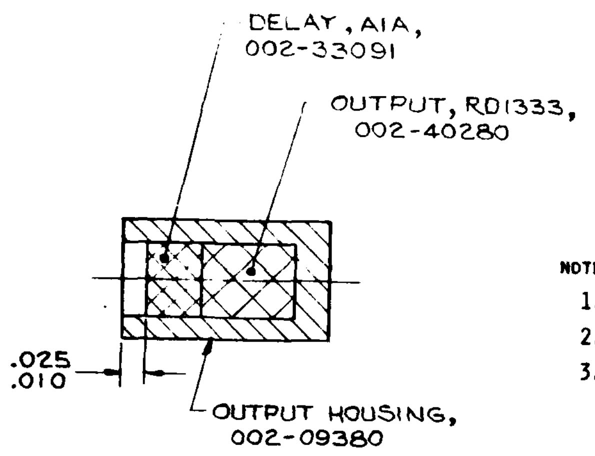
NEXT ASS'Y.: 176-00100, 176-00060

SCALE 10-1
DRAWN BY STURGIS
CHECKER
PROJECT ENG. RJW
APPROVED BY DGS
APPROVED BY
DATE 11-1-74

FERRULE
STAB DELAY PRIMER & DET.

ATLAS AEROSPACE DIVISION
ICI United States Inc.
Valley Forge, PA 19482

SHEET 1 OF 1
NO. 002-08770



NOTES:

1. LOAD 27 MG (NOMINAL) RD1333 (002-40280) AND PRESS AT 50,000 ± 5,000 PSI.
2. LOAD 9 MG (NOMINAL) AIA (002-33091) AND PRESS AT 50,000 ± 5,000 PSI.
3. CHARGE WEIGHTS OF OUTPUT AND DELAY POWDERS TO BE ADJUSTED TO GIVE DELAY TIME OF .010 ± .005 SECONDS OVER TEMPERATURE RANGE OF -65°F TO +150°F. THE MINIMUM OUTPUT CHARGE SHALL NOT BE LESS THAN 20 MG. THE DELAY CHARGE WEIGHT SHALL BE CONSISTENT WITH THE .010/.025 DIMENSION.

REVISIONS				
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USED ON	
APPLICATION	

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TOLERANCES ARE:
FRACTIONS ± DECIMALS .XX ± .XXX ± ANGLES ±
MATERIAL
FINISH
DO NOT SCALE DRAWING

CONTRACT NO.

APPROVALS		DATE
DRAWN	F C B	3/11/80
CHECKED	JAC	3/11/80

ICI Americas Inc.
Valley Forge, PA 19482

OUTPUT ASSEMBLY

SIZE	CODE IDENT NO.	DRAWING NO.
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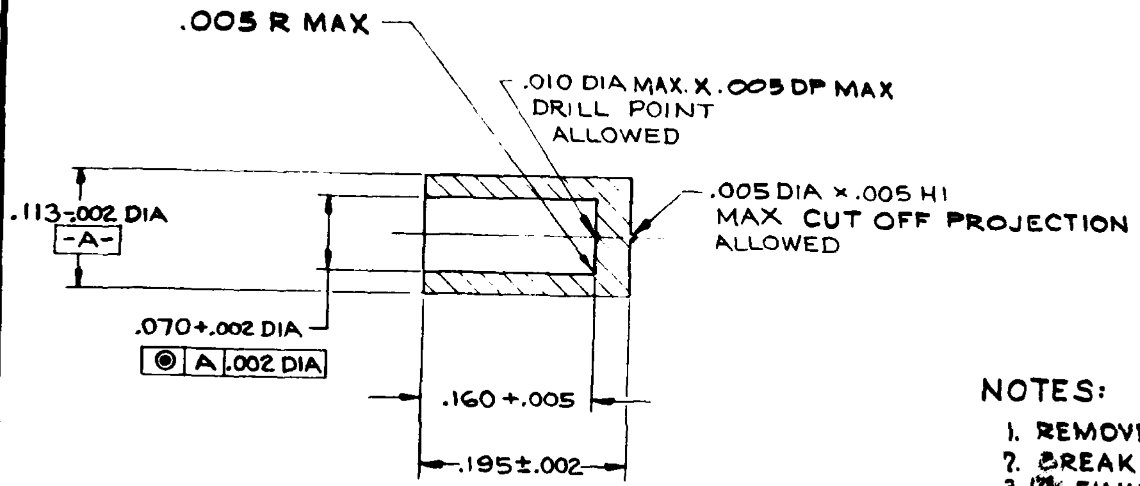
SCALE 10/1 SHEET 1 OF 1



NOTES:

1. REMOVE ALL BURRS
2. BREAK ALL SHARP CORNERS - .005 RAD/CHAM MAX
3. FINISH

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
	1	REV. PER ECN 20454	9/1/80	

NEXT ASSY	002-55320
MATERIAL	AL ALY TYPE 2024-T4 PER ASTM B-211
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CHECKED	JMC 3/11/80
COMPANY	ICI Americas Inc. Valley Forge, PA 19482
TITLE	OUTPUT HOUSING
SIZE	B
DRAWING NO.	002-09380
SCALE	10/1
SHEET	1 OF 1

DO NOT SCALE DRAWING

NO.	REVISIONS	DATE
3.	REDRAWN WITH P/N 002-33091 ADDED ECN 10564	4/16/70

IGNITION COMP. A-1A

PER MIL-P-22264

PART NO.	TYPE	ZIRCONIUM POWDER 000-00750	IRON OXIDE (FERRIC OXIDE) 000-15250	DIATOMACEOUS EARTH 002-33430
002-33090*	STANDARD			
002-33091	MODIFIED (SEE NOTE 3)	64.25%	24.25%	11.50%

NOTES:

1. INTERPRET DWG IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-STD-100.
2. IDENTIFY CONTAINER AS CONTAINING 002-33090 IGNITION COMPOUND A-1A OR 002-33091 MODIFIED IGNITION COMPOUND A-1A.
3. PERCENTAGES BY WEIGHT PER MIL-P-22264 DO NOT APPLY.

TYPE OF CERTIFICATION

QUALITATIVE________

QUANTITATIVE ✓

NONE ________

*DESIGN PREPARED FOR LMSC/MSD AND GOVERNMENT PRIME CONTRACT UNDER GOVERNMENT PRIME NO. NO 003066C0186.

MAT'L:		SCALE	IGNITION COMP. A-1A
		DRAWN BY	
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DECIMALS ±	002-33341	APPROVED BY	
FINISH IS IN MICROINCHES	250-02210	APPROVED BY	SHEET 1 OF 1
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APPLICATION		REVISION			
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		2	Correct Sources. ECN 14847	8/9/79	[illegible]

ARCON 2795	(003-87190)	70%
VERSAMID 125	(003-87180)	30%

APPROVED SOURCE:

ARCON 2795 - ALLIED RESIN CORP.
EAST WEYMOUTH, MASS. 02189

VERSAMID 125 - GENERAL MILLS
CHEMICAL DIV.
KANKAKEE, ILL.

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CENTENNIAL BLUEPRINT N49912

NO.	REVISIONS	DATE

VERSAMID 125
(NYLON RESIN)

QUALITATIVE - CERT.
SUGG. SUPPLIER - GENERAL MILLS
CHEMICAL DIV.
KANKAKEE, ILL.

MAT'L:

UNLESS OTHERWISE NOTED
DIMENSIONS ARE IN INCHES
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DECIMALS ±
FINISH IS IN MICROINCHES

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DATE

VERSAMID 125

ATLAS CHEMICAL INDUSTRIES, INC.
WILMINGTON 99, DEL.
AEROSPACE COMPONENTS DIVISION

SHEET OF

NO. 003-87180

NO.	REVISIONS	DATE
1	WAS ERL 2795 ECN 16405	3/24/75

ARCON 2795
(EPOXY RESIN)

QUALITATIVE CERT.
SUGG. SUPPLIER - ALLIED RESIN CORP.
EAST WEYMOUTH, MASS. 02189

MAT'L:		SCALE DRAWN BY CHECKER	ARCON 2795
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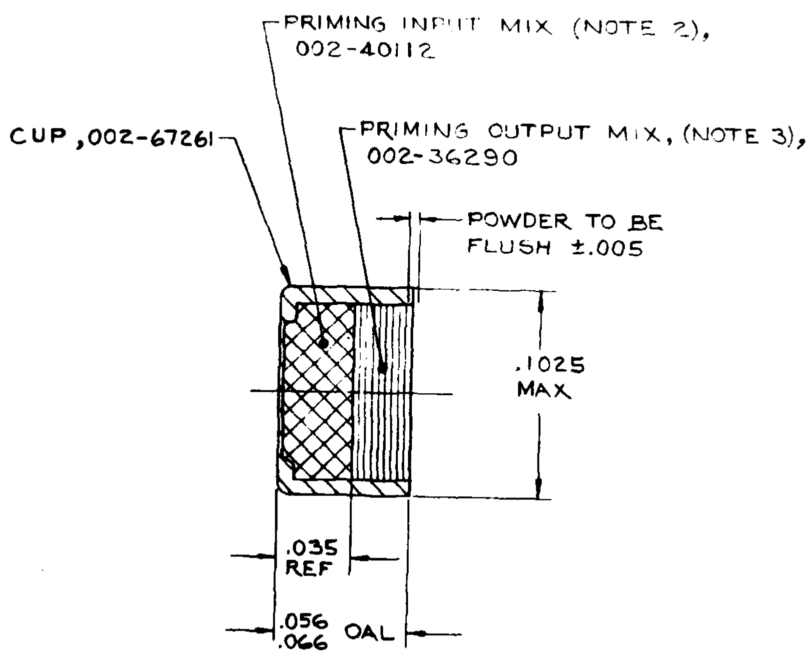
G. B. CO. 40-178 1-63



Notes:

1. Interpret dwg. in accordance with MIL-D-1000
2. Priming Input Mix (PIM) 11/13 mg. consolidate using 85,000 ± 5000 psi.
3. Priming Output Mix (POM) 15 ± 1/2 mg. Consolidate using 40,000 ± 2000 psi.

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

176-00060	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:
FRACTIONS ± ~ DECIMALS .XX ± ~ .XXX ± ~ ANGLES ± ~
MATERIAL
FINISH
DO NOT SCALE DRAWING

CONTRACT NO.

APPROVALS		DATE
DRAWN	FCB	3-6-75
CHECKED		
P.E.	WELKER	3/7/75

ICI United States Inc.
Valley Forge, PA 19482

INPUT CUP ASSY

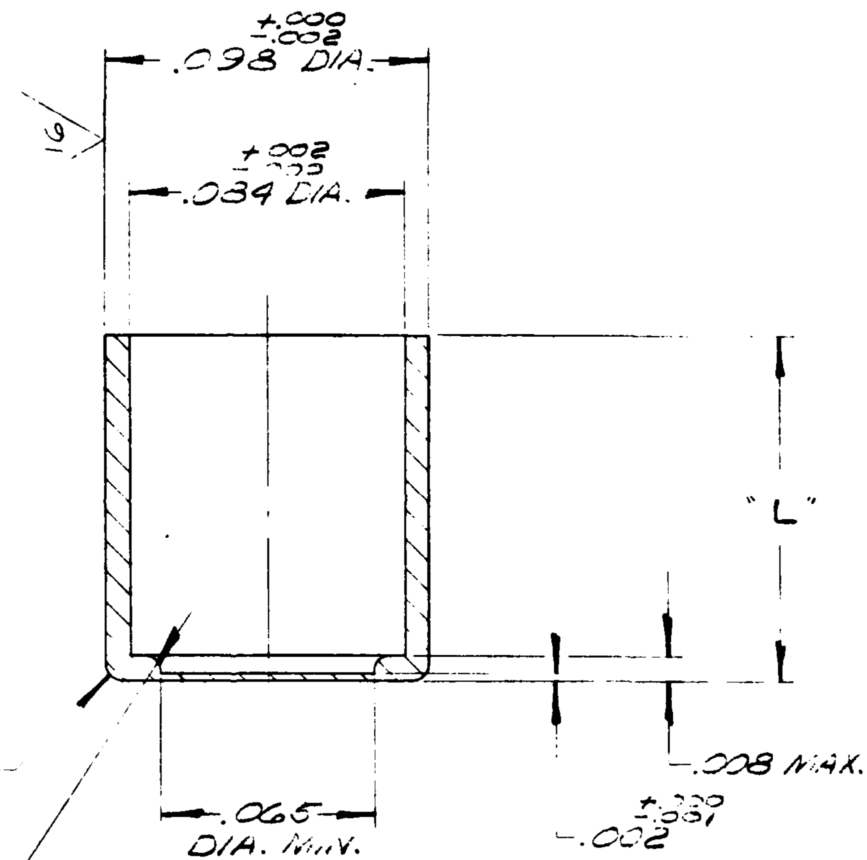
SIZE	CODE IDENT NO.	DRAWING NO.
B		002-34020

SCALE 20/1 SHEET 1 OF 1

PART NO.	"L"
002-67260	.105 +.000 -.005
002-67261	.065 +.005 -.000

NO.	REVISIONS	DATE
1.	ADD P/N-67261, FINISH & TAB LENGTH ECN 16299	10-9-74
2.	REV PER ECN 16338 RDW	11-11-74
3.	.065 WAS +.000 -.005 .008R WAS .005/.010 ECN 16783	11-25-76 RDW

TYPE OF CERTIFICATION
QUANTITATIVE
NONE



NOTES
1. SPEC MIL-A-2550 APPLIES.
2. MATERIAL: ALUMINUM ALLOY, 1100-0, SHEET OR STRIP, SPEC ASTM B209
3. 32 ALL OVER EXCEPT AS NOTED.

MAT'L:		SCALE 20:1
UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES FRACTIONS ± ANGLES ± DECIMALS ± FINISH IS IN MICROINCHES	NEXT ASS'Y.	DRAWN BY RW CHECKER PROJECT ENG. APPROVED BY APPROVED BY DATE 7-2-69

ATLAS AEROSPACE DIVISION
ICI United States Inc.
Valley Forge, PA 19482

SHEET 1 OF 1 NO. 002-6726-

PRIMER OUTPUT MIXTURE

NOTE 2

COMPOSITION BY WEIGHT	MATERIAL	ICI PN	SPECIFICATION	SIEVE SIZE NOTE 1
11 ± 1.0%	LEAD AZIDE, RD1333	002-40280	MIL-L-46225	-
27 ± 1.0%	ZIRCONIUM	000-00950	MIL-Z-399	-150
62 ± 1.0%	LEAD PEROXIDE	000-15410	MIL-L-376B	-100

NOTES:

1. SIEVES PER RR-S-366 TP 1 CL 1.
2. HANDLE, DRY AND BLEND ALL INGREDIENTS PER MI 002-36290.

NAVAIR DWG. 488AS155

REV.	ECN.	DATE	APPROVED

REVISIONS

MAT'L:

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES
FRACTIONS ± ANGLES ±
DECIMALS ±
FINISH IS IN MICROINCHES

NEXT ASS'Y.

SCALE
DRAWN BY JDH
CHECKER
PROJECT ENG. RDW
APPROVED BY RDW
APPROVED BY [illegible]
DATE 6-16-75

PRIMER OUTPUT MIXTURE

ATLAS CHEMICAL INDUSTRIES, INC.
WILMINGTON 99, DEL.
AEROSPACE COMPONENTS DIVISION

SHEET 1 OF 1 | NO. 002-36290

PRIMING INPUT MIX

NOTE 2

COMPOSITION BY WEIGHT	MATERIAL	ICI-PN	SPECIFICATION	SIEVE SIZE NOTE 1
40 ± 2.0%	BASIC LEAD STYPHNATE	002-40151	MIL-L-16355(WP)	
5 ± 0.5%	TETRACENE	002-40161	MIL-T-46938(MU)	THRU 325
15 ± 1.5%	ANTIMONY TRISULFIDE	000-15780	MIL-A-159 CLASS 2 OR 5	-140 + 200
20 ± 2.0%	BARIUM NITRATE	000-15800	MIL-B-162 CLASS 1 OR 3	-70 + 140
20 ± 2.0%	LEAD AZIDE, RD1333	002-40280	MIL-L-46225	

NOTES:

1. SIEVES PER RR-S-366 TP 1 CL 1.
2. HANDLE, DRY AND BLEND ALL INGREDIENTS PER MI 002-40112

NAVAIR DWG 488AS155

REV.	SCH.	DATE	APPROVED
REVISIONS			

MAT'L:

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES
FRACTIONS ± ANGLES ±
DECIMALS ±
FINISH IS IN MICROINCHES

NEXT ASS'Y.

SCALE
DRAWN BY JDH
CHECKER
PROJECT ENG. RDW
APPROVED BY RDW
APPROVED BY JCB
DATE 6-16-75

PRIMING INPUT MIX

ATLAS CHEMICAL INDUSTRIES, INC.
WILMINGTON 99, DEL.
AEROSPACE COMPONENTS DIVISION

SHEET 1 OF 1 NO. 002-40112

APPLICATION		REVISION			
NEXT ASSY	USED ON	LTR	DESCRIPTION	DATE	APPROVED

PROCESSED LEAD AZIDE RD1333

per M.I. 002-40280

RAW MATERIAL IS LEAD AZIDE RD1333

per MIL-L-46225

(000-15950)

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS ± DECIMALS .XX ± .XXX ± ANGLES ±	CONTRACT NO.		ICI Americas Inc. Valley Forge, PA 19482
	APPROVALS	DATE	
	DRAWN MEP	12/2/81	
MATERIAL	CHECKED JNC	12/2/81	PROCESSED LEAD AZIDE RD1333
FINISH			SIZE A · CODE IDENT NO. · DRAWING NO. 002-40280
DO NOT SCALE DRAWING			SCALE · SHEET 1 OF 1

APPLICATION		REVISION			
NEXT ASSY	USED ON	LTR	DESCRIPTION	DATE	APPROVED

O - RING

SILICONE

SIZE 2-007

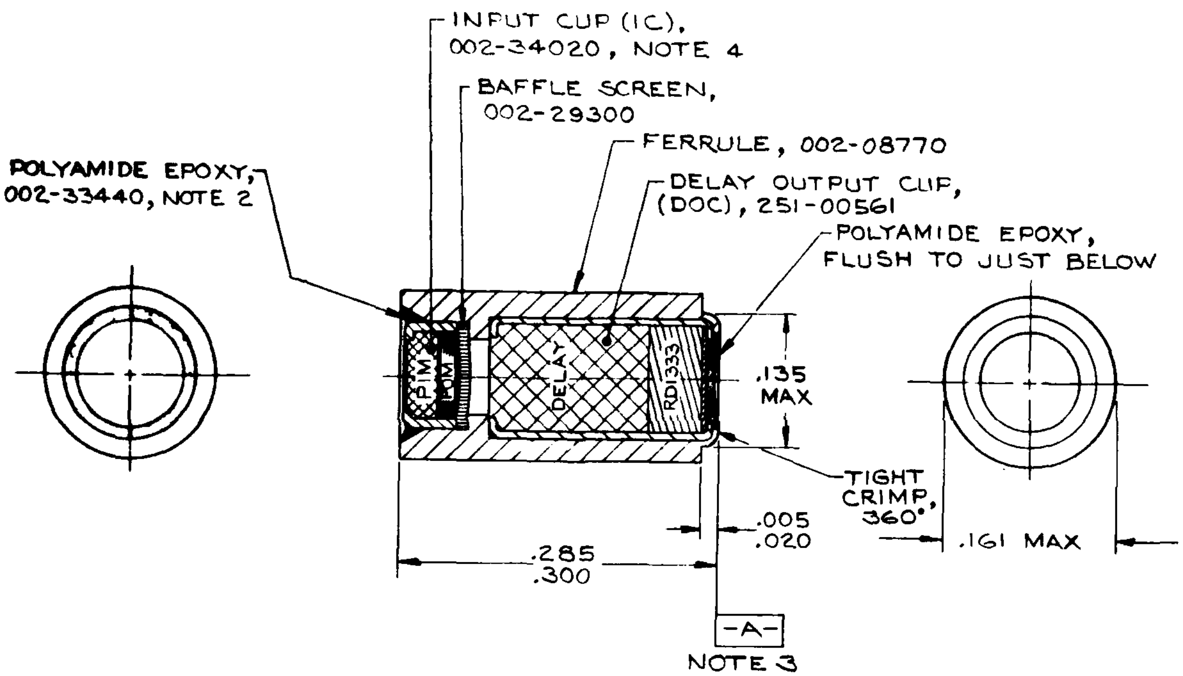
70 DUROMETER

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:	CONTRACT NO.		ICI Americas Inc. Valley Forge, PA 19482		
FRACTIONS ± DECIMALS .XX ± .XXX ± ANGLES ±	APPROVALS	DATE			
	DRAWN DRB	1/31/79	O - RING		
MATERIAL	CHECKED JSW	1/31/79			
FINISH			SIZE A	CODE IDENT NO.	DRAWING NO. 002-15950
DO NOT SCALE DRAWING			SCALE		SHEET 1 OF 1

CENTENNIAL BLUEPRINT N49912

APPENDIX B.--0.1-S STAB DELAY PRIMER DRAWINGS

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
		REVISE NOTE 4 E.O. 16494	6-16-75	



Notes:

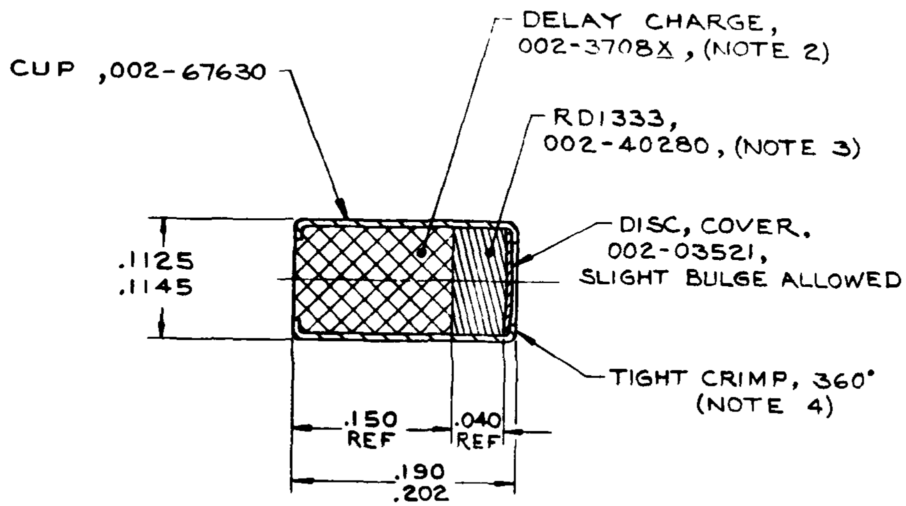
1. Interpret dwg. in accordance with MIL-D-1000.
2. Confine epoxy application to entrance chamfer provided.
3. Keep epoxy drops off surface $\boxed{-A-}$.
4. Input cup to be L.P.F. to insure epoxy does not fill baffle screen. Insert .005" above to .012" below flush.

NEXT ASSY	USED ON	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS ± ~ DECIMALS .XX ± ~ .XXX ± ~ ANGLES ± ~	CONTRACT NO.	
APPLICATION		MATERIAL	APPROVALS	DATE
		FINISH	DRAWN F C B	3-6-75
		DO NOT SCALE DRAWING	CHECKED	
			P E WELKER	3/7/75

ICI United States Inc.
Valley Forge, PA 19482

STAB DELAY PRIMER ASSY

SIZE	CODE IDENT NO.	DRAWING NO.
B		176-00060
SCALE 10/1		SHEET 1 OF 1



Notes:

1. Interpret dwg in accordance with MIL-D-1000.
2. Delay Blend-Weight are reference only. Barium Chromate/Boron ($BaCrO_4/B$) 86/14. 50 mg consolidated at 40,000 ± 5000 psi. Charge in either one or two increments. Barium Chromate per MIL-L-550, Grade A.
3. Output charge, Lead Azide, RD 1333. 16-18mg consolidated at 15,000 ± 2000 psi.
4. Crimping pressure shall not exceed 30,000 psi.
5. Required delay time measured with reference to the time of function of the stab delay primer ass'y (176-00060) shall be between 30 and 150 ms when measured over the temperature range -65 to +160°F.

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

17ˉ-00060	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:
FRACTIONS ± ~ DECIMALS .XX ± ~ .XXX ± ~ ANGLES ± ~
MATERIAL
FINISH
DO NOT SCALE DRAWING

CONTRACT NO.

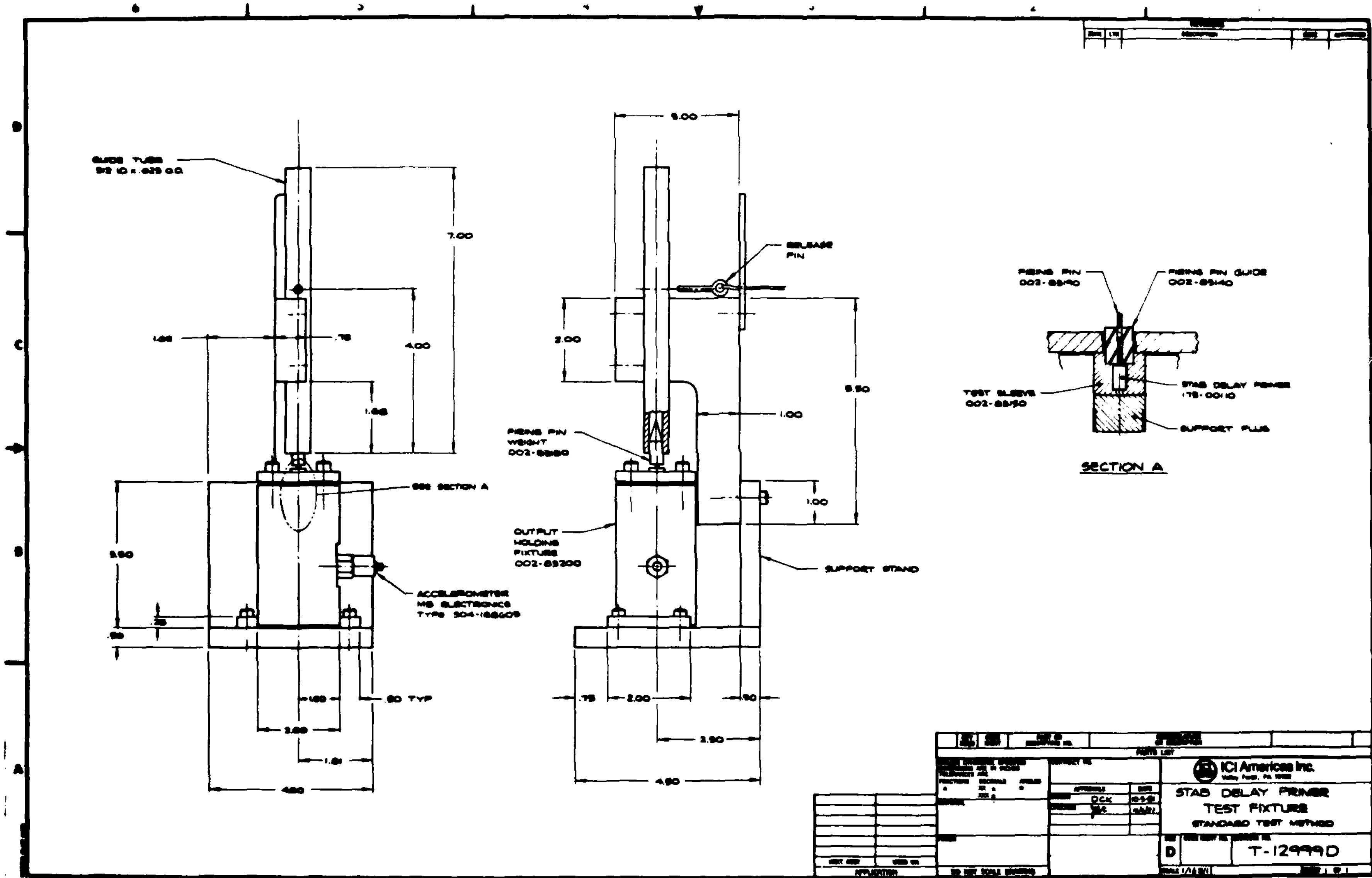
APPROVALS		DATE
DRAWN	F C B	3-6-75
CHECKED		
P.E.	R.D.W.	3/7/75

ICI United States Inc.
Valley Forge, PA 19482

DELAY OUTPUT CUP ASSY

SIZE	CODE IDENT NO.	DRAWING NO.
B		251-00561
SCALE 10/1		SHEET 1 OF 1

APPENDIX C.--ICI STAB DELAY PRIMER TEST FIXTURE


GUIDE TUBE
.512 ID x .625 O.D.
7.00
4.00
1.65
1.66
.75
SEE SECTION A
ACCELEROMETER
MB ELECTRONICS
TYPE 304-188609
.50 TYP
1.00
2.50
1.81
4.50
5.00
RELEASE
PIN
2.00
9.50
1.00
FIRING PIN
WEIGHT
002-88180
OUTPUT
HOLDING
FIXTURE
002-88200
SUPPORT STAND
.75
2.00
.50
2.50
4.50
FIRING PIN
002-88190
FIRING PIN GUIDE
002-88140
TEST SLEEVE
002-88150
STAB DELAY PRIMER
175-0010
SUPPORT PLUG
SECTION A
ICI Americas Inc.
STAB DELAY PRIMER
TEST FIXTURE
STANDARD TEST METHOD
DCK
D
T-12999D
DO NOT SCALE DRAWING
APPLICATION

APPENDIX D.--PREPRODUCTION TEST RESULTS

ICI UNITED STATES INC.
(Atlas Aerospace Division)

W. D. L. Primers

Date: 2-18-86
Proj # 1369
Sht 1 of 3

Development Laboratory Report

Bresso Pin .067
Doc # DFG

	Ohms	[illegible] RD 1333 25 mg	AIA 160-2 11 mg	Empty Spacer Stop		Ohms	[illegible] RD 1333 25 mg	AIA 160-2 11 mg	Empty Spacer Stop
1	12.92	.103	.048	.012	21	16.35	.103	.048	.012
2	11.91	.102	.048	.013	22	11.80	.102	.047	.013
3	10.13	.102	.046	.015	23	10.45	.100	.047	[illegible]
4	15.08	.103	.050	.011	24	14.55	.101	.046	[illegible]
5	12.33	.103	.047	.013	25	13.16	.102	.048	.012
6	13.73	.102	.048	.012	26				
7	12.01	.104	.048	.011	27	$\bar{x}$ =	13.33		
8	14.08	.101	.046	.016	28	S =	1.62		
9	15.16	.103	.048	.012	29				
10	14.36	.100	.047	.015	30				
11	11.76	.101	.047	.015	31				
12	14.30	.102	.048	.014	32				
13	11.71	.101	.046	.015	33				
14	11.17	.102	.048	.013	34				
15	13.65	.100	.048	.015	35				
16	14.89	.101	.047	.014	36				
17	12.03	.100	.046	.016	37				
18	11.91	.101	.045	.015	38				
19	11.31	.103	.047	.013	39				
20	13.12	.103	.047	.012	40				

~~TEST BY:~~

Test By D. Murphy

INPUT DATA

12.920	11.910	10.130	15.080	12.330
13.730	12.010	14.080	15.160	14.360
11.760	14.300	11.710	14.170	13.650
14.890	12.030	11.910	11.310	13.120
16.350	11.860	16.450	14.550	13.160

```
MEAN=          13.317
SIGMA=          1.620

     10.130
              X
     10.920
              X
     11.710
              XXXXXXXX
     12.500
              XXX
     13.290
              XX
     14.080
              XXXXX
     14.870
              XXX
     15.660
              XX
     16.450
```

ICI UNITED STATES INC.
(Atlas Aerospace Division)

H.D.L. Primer

Development Laboratory Report

Date: 2/2?/80
Proj # 1369
Sht ____ of ____

Prim .067
??? # OFg

	Cm	Stabilizer RD 1383 27 mg	A1.7 160-2 9 mg	Space Gap
1	9.48	.108	.037	.018
2	11.91	.108	.038	.017
3	12.22	.110	.040	.012
4	11.49	.109	.042	.012
5	8.17	.101	.039	.017
6	9.53	.111	.038	.013
7	13.62	.109	.039	.014
8	10.59	.109	.040	.014
9	11.75	.107	.038	.017
10	9.15	.109	.038	.014
$\bar{x}$ =	10.82			
S =	1.66			

TEST BY: M. Murphy

INPUT DATA

9.480	11.910	12.220	11.490	8.170
9.830	13.620	10.590	11.750	9.150

```
MEAN=        10.821
SIGMA=        1.665

     8.170
           X
     8.851
           XX
     9.532
           X
    10.214
           X
    10.895
           X
    11.576
           XXX
    12.257

    12.939
           X
    13.620
```

Firing Temperature
-65° F

ICI UNITED STATES INC.
(Atlas Aerospace Division)

H.D.L. Primer

Date: 2-25-80
Proj # 1369
Sht 1 of 3

Development Laboratory Report

Press Pin .067 Force 200 # DFG.

	Cms	Lead Azide RD 1333 27 mg	A1A 160-2 9 mg	Space to Top			Cms	Lead Azide RD1333 27 mg	A1A 160-2 9 mg	Space to Top
1	9.48	.107	.031	.017		21	13.21	.106	.040	.013
2	10.64	.107	.039	.015		22	18.26	.107	.040	.014
3	12.94	.107	.039	.015		23	14.80	.107	.041	.014
4	12.20	.108	.037	.017		24	14.63	.106	.040	.016
5	12.08	.108	.039	.014		25	9.86	.109	.039	.015
6	10.58	.108	.040	.013		26	12.53	.109	.036	.016
7	9.54	.108	.040	.013		27	14.65	.109	.038	.014
8	10.70	.108	.039	.014		28	13.22	.109	.039	.14
9	11.29	.106	.038	.017		29	11.69	.109	.039	.014
10	10.71	.107	.038	.017		30	11.14	.109	.040	.013
11	10.26	.108	.038	.015		31	9.62	.109	.038	.014
12	10.23	107	.037	.016		32	12.13	.109	.038	.015
13	9.19	.108	.036	.017		33	11.73	.109	.039	.011
14	13.66	.107	.040	.014		34	12.87	.108	.039	.014
15	14.77	.108	.041	.012		35	13.26	.109	.037	.016
16	11.39	.109	.038	.014		36	11.21	.109	.038	.00
17	14.25	.109	.038	.014		37	12.66	.109	.039	.014
18	14.33	.110	.041	.012		38	10.76	.110	.040	.012
19	12.93	.108	.041	.013		39	10.81	.109	.038	.015
20	9.77	.109	.040	.012		40	10.79 ~~TEST BY:~~	.109	.037	.015
					$\bar{x}$	11.99	Test By		M. Murphy	
					S	1.89				

INPUT DATA

9.480	10.640	12.940	12.200	12.080
10.580	9.540	10.700	11.290	10.710
10.260	10.830	9.190	13.060	14.770
11.390	14.250	14.330	12.930	9.770
13.210	18.260	14.800	14.630	9.860
12.530	14.050	13.220	11.690	11.140
9.620	12.130	11.730	12.870	13.260
11.210	12.060	10.760	10.810	10.790

MEAN=   11.985
SIGMA=   1.887

```
   9.190
          XXXXXXX
  10.324
          XXXXXXXXXXXX
  11.457
          XXXXXXX
  12.591
          XXXXXXX
  13.725
          XXXXXX
  14.859

  15.992

  17.126
          X
  18.260
```

Firing temperature
+150° F

Press. Dim. .067
Force 200# Drg.

ICI UNITED STATES INC.
(Atlas Aerospace Division)

H.D.L. Primers

Development Laboratory Report

Date: 2-26-80
Proj # 1369
Sht 2 of 3

	Cms	Lead Azide RD 1333 27 mg	A1A 160-2 9 mg	Space to top			Cms	Lead Azide RD 1333 27 mg	A1A 160-2 9 mg	Space to Top
41	11.10	.109	.041	.011		61	11.30	.109	.038	.014
42	9.67	.108	.038	.015		62	14.29	.109	.040	.012
43	8.75	.109	.037	.015		63	10.26	.108	.037	.016
44	11.01	.109	.037	.014		64	13.23	.109	.041	.011
45	12.33	.110	.039	.013		65	15.66	.108	.039	.013
46	11.28	.109	.037	.015		66	12.44	.109	.040	.012
47	13.13	.109	.042	.012		67	11.87	.108	.040	.013
48	11.83	.109	.039	.013		68	13.56	.109	.039	.013
49	10.61	.109	.037	.015		69	10.03	.108	.038	.015
50	11.32	.109	.041	.012		70	11.61	.109	.038	.015
51	9.42	.110	.037	.014		71	12.35	.109	.041	.012
52	11.56	.109	.039	.014		72	9.33	.109	.041	.012
53	9.80	.109	.041	.011		73	10.07	.110	.041	.011
54	11.[illegible]	.109	.041	.012		74	9.58	.109	.041	.011
55	8.38	.109	.037	.014		75	11.63	.109	.038	.015
56	10.53	.108	.037	.015		76	10.40	.110	.041	.011
57	11.26	.110	.038	.013		77	11.15	.109	.039	.014
58	8.46	.110	.037	.015		78	10.40	.109	.038	.015
59	13.91	.108	.041	.013		79	11.09	.108	.041	.012
60	10.06	.109	.037	.014		80	11.42 ~~TEST BY:~~	.109	.039	.014
		$\bar{x}$	11.19		~~$\bar{x}$~~	~~10.94~~	Test By	M. Murphy		
		S	1.59		~~S~~	~~2.37~~				

INPUT DATA

11.100	9.670	8.750	11.010	12.330
11.280	13.130	10.830	10.610	11.320
9.420	11.560	9.800	11.850	8.380
10.530	11.200	8.400	13.910	10.060
11.300	14.290	10.260	13.230	15.600
12.880	11.890	13.500	10.030	11.610
12.350	9.330	10.070	9.580	11.630
10.900	11.150	10.400	11.090	11.420

```
MEAN=          11.191
SIGMA=          1.587

     8.380
            XXX
     9.282
            XXXXXXXX
    10.185
            XXXXXXX
    11.087
            XXXXXXXXXXXXX
    11.990
            XXX
    12.892
            XXX
    13.795
            XX
    14.697
            X
    15.600
```

Ambient

ICI UNITED STATES INC.
(Atlas Aerospace Division)

HDL Primer

Date: 2-26-80
Proj # 1369
Sht 3 of 3

Development Laboratory Report

Press Pin .067
Force 200# DFG.

	Oms	Lead Azide RD1333 27mg	A1A 160-2 9mg	Space to Top			Oms	Lead Azide RD1833 27mg	A1A 160-2 9mg	Space to Top
81	11.58	.108	.038	.015		101	12.45	.109	.039	.013
82	10.50	.109	.038	.014		102	12.34	.110	.038	.013
83	12.41	.108	.040	.013		103	not fired	.109	.040	.013
84	11.[illegible]	.110	.038	.014		104	"	.108	.039	.014
85	12.78	.108	.038	.015		105	"	.107	.040	.014
86	9.49	.108	.037	.015		106	"	.108	.040	.013
87	13.65	.108	.037	.015		107	"	.109	.040	.012
88	12.86	.108	.039	.014		108	"	.108	.039	.015
89	9.72	.108	.037	.016		109	"	.108	.038	.014
90	12.41	.108	.039	.014		110	"	.108	.038	.015
91	11.49	.108	.038	.015						
92	11.43	.109	.041	.011		$\bar{x}$	11.51			
93	11.22	.108	.039	.014		S	1.18			
94	12.04	.109	.038	.014						
95	11.79	.108	.041	.013						
96	11.86	.108	.040	.014						
97	10.62	.108	.040	.012						
98	9.01	.108	.040	.014						
99	12.28	.109	.040	.012						
100	12.01	.109	.040	.012						

TEST BY:

INPUT DATA

11.880	10.500	12.410	11.050	12.780
9.490	13.650	12.860	9.720	12.410
11.490	11.430	11.220	12.040	11.790
11.860	10.620	9.010	12.280	12.010
12.450	10.340			

```
MEAN=          11.513
SIGMA=           1.175

     9.010
           XX
     9.590
           X
    10.170
           XXX
    10.750
           XX
    11.330
           XXXXX
    11.910
           XXXXXX
    12.490
           XX
    13.070
           X
    13.650
```

APPENDIX E.--FINAL INSPECTION AND TEST PROCEDURE

Prepared By: DNB	STAB DELAY PRIMER ASSEMBLY ICI Americas Inc. Atlas Aerospace Division	Part No.: 176-00110
Approved By: JTML		Operation No.:
Effective Date: 5/20/80	Inspection Instruction	Page 1 of 4

Characteristic Number	Characteristic	Class of Defect	AQL - LPTD	Inspection Device Code	Standard Practice Instruction
	FINAL ACCEPTANCE				
001	Overall Length		1.0		.300" maximum
002	Outside dia.		1.0		.161" maximum
003	X-ray		50/ lot		X-ray 50 units per lot. One view-dark for powder check units for the following: 1. Input cup 2-increments of powder PIM POM 2. Baffle screen 3. Output assembly 2-increments of powder DELAY RD 1333 If any discrepancies are found, x-ray lot 100%
004	Visual		100%		All primers shall be visually inspected prior to testing or shipment for the following: a) Cracks, splits or cut through cup b) Explosive on exterior of assembly c) Explosive exposed at either end d) Input end must have evidence of red epoxy (cup end) e) Output end epoxy must be color coded green and flush to just below crimp f) Sealant missing either end g) Input cup must have at least .06 of its end exposed. Epox' not allowed within this diameter. h) Input end cup distorted i) Input cup wrinkled or folded j) Crimp output end not 360° k) Crack at crimp l) Evidence of poor workmanship

Prepared By: DNB	Part No.: 176-00110
Approved By: JTML	Operation No.:
Effective Date: 5/20/80	Page 2 of 4

Characteristic Number	Characteristic	Class of Defect	AQL - LTPD	Inspection Device Code	Standard Practice Instruction
005	Sample				100 primers shall be selected for input energy - delay time - output energy tests. 50 primers shall be selected and sent to HDL for shock tests as specified in characteristics I.6.1 and I.6.2.
006	Input energy - Delay time - Output energy tests		100		The 100 primers shall be staked into test sleeve 002-83150. 50 assemblies shall be conditioned for a minimum of 2 hours in a chamber stabilized at -65°F. 50 assemblies shall be conditioned for a minimum of 2 hours in a chamber stabilized at +150°F. Within one minute after removing a primer assembly from its applicable temperature it will be tested per the following scheme. The following parts are required: Test sleeve - 002-83150 Firing pin guide - 002-83140 Dent block - 002-83170 Holder - 002-83162 Firing pin - 002-83190 Firing pin weight - 002-83180 Holder and stand off sleeve Accelerometer - Endevco Model 2211 or equivalent Oscilloscope - Tektronix model 5103N or equivalent. Fixture - 002-83200 Drop tube - Primer - M55 Primer Holder - 002-83150 Equipment set up: • Connect transducer output to channel A of oscilloscope. Also to external trigger. • Set scope at 5 volts/dir. • Set time for channel A at 2sec/cm. • Set A trigger to + and external • Set B mode A dual A single sweep, B SWP B OUT: + SLOPE

Prepared By: DNB	ICI Americas Inc. Atlas Aerospace Division	Part No.: 176-00110
Approved By: JTML		Operation No.:
Effective Date: 5/20/80	Inspection Instruction	Page 3 of 4

Characteristic Number	Characteristic	Class of Defect	AQL - LTPD	Inspection Device Code	Standard Practice Instruction
					Stab Delay Test Procedures as follows: 1. Insert Dent Block 002-83170 into fixture per drawing 002-83200. 2. Insert Holder 002-83162 without primer into fixture. 3. Insert Primer Holder 002-83150 into fixture. Also firing pin guide 002-83140. Note: Tape opening of empty primer holder. 4. Place fixture in "V" Block under drop tube. 5. Sight down tube to check alignment of firing pin guide - adjust "V" block as required. 6. Insert firing pin, 002-83190, into firing pin guide. 7. Measure height from top of firing pin to top of hole, in drop tube, which holds pin supporting the drop weight. Height should be 3 inches max. 8. Remove all parts except dent Block (steps 2 thru 6). 9. Place some DC-4 into hole of holder and on Dent Block. 10. Place primer, M55, into holder with green side up (visible). 11. Place holder with primer into fixture with M55 against dent block. 12. Insert Primer 176-00110 with input end up (output facing M55 holder). 13. Insert firing pin guide, 002-83140 into input end of primer holder.

STAB DELAY PRIMER ASSEMBLY

Prepared By: DNB	ICI Americas Inc. Atlas Aerospace Division	**Part No.:** 176-00110
Approved By: JTML		**Operation No.:**
Effective Date: 5/20/80	**Inspection Instruction**	**Page** 4 **of** 4

Characteristic Number	Characteristic	Class of Defect	AQL - LPTD	Inspection Device Code	Standard Practice Instruction
					14. Place hold down clamp over assembly and tighten the four screws. 15. Place fixture against "V" block under drop tube. 16. Carefully insert firing pin into firing pin guide. 17. Insert weight restraining pin. 18. Place weight in drop tube. 19. Close firing booth door. 20. Reset scope. 21. Pull weight restraining pin. 22. Remove primer. Reset scope. 23. Verify drop tube is clear. 24. Repeat steps 9 through 23 for each primer.
007	Input Energy - Delay Time - Output energy tests on units subjected to shock pulses		50		The 50 primers sent ot HDL for shock tests shall be tested after shock tests, per steps 1 thru 24 above (Characteristic Number 006)

APPENDIX F.--PILOT LOT TEST RESULTS

LAB. TEST REPORT

ICI ATLAS AEROSPACE DIVISION

Dwg/part # 176-00110	Part name STAB DELAY PRIMER ASSY		Test date 10-2-80
Customer order # DAAK21-79-R-9064	Atlas order # 1369		Lot # 1369-001
Sample size 50	Spec. # PER CONTRACT	Spec. par. F.2.6	Spec. Min: Max:

High	Low	$\bar{X}$	K	Sigma	No fire	All fire
22.0	10.0	14.43		2.47		1/4 oz. 4"

Environment: FOLLOWING HDL SHOCK AMBIENT

Environment:

#	Ohms	no fire acc.	no fire rej.	DENT	Time (mSEC)	#	Ohms	no fire acc.	no fire rej.	DENT	Time (mSEC)
1		✓		.014	17.0	26		✓		.007	12.0
		✓		.016	15.0			✓		.013	16.0
		✓		.012	13.0			✓		.007	11.0
		✓		.015	11.5			✓		.013	17.0
5		✓		.013	11.0	30		✓		.011	18.5
	DID NOT FIRE			M-55				✓		.012	13.0
		✓		.015	16.0			✓		.018	14.5
		✓		.007	12.5			✓		.009	14.5
		✓		.014	12.0			✓		.008	11.0
10		✓		.018	17.0	35	DID NOT FIRE			M-55	
		✓		.011	12.0			✓		.007	13.5
		✓		.015	17.0			✓		.014	15.0
	DID NOT FIRE			M-55				✓		.014	20.0
		✓		.013	14.0			✓		.017	13.0
15		✓		.015	13.5	40		✓		.015	13.5
		✓		.016	11.5			✓		.016	22.0
		✓		.014	11.0			✓		.017	17.5
		✓		.011	15.5			✓		.015	12.0
		✓		.011	13.5			✓		.014	10.5
20		✓		.010	21.0	45		✓		.017	13.5
		✓		.015	14.5			✓		.017	10.0
		✓		.012	16.0			✓		.018	13.5
		✓		.010	20.5			✓		.014	15.5
		✓		.017	18.0		DID NOT FIRE			M-55	
25		✓		.014	13.0	50		✓		.015	11.0

PULL TEST		BEND TEST		RESISTANCE		OUTPUT		DUDS	
Sample	Failures	Sample	Failures	Sample	Failures	Sample	Failures	Sample	Failures
						46	0	50	4

MEETS SPEC: Yes [ ] No [X]

Test personnel: Leah Graves

MEETS SPEC: Yes [ ] No [X]

WITNESSED J. Zanelli, DCAS QAR
Government Inspector

J. Federico
Final Inspection Technician

ATL. 0119A

INPUT DATA

17.000	15.000	13.000	11.500	11.000
16.000	12.500	12.000	17.000	12.000
17.000	14.000	13.500	11.500	11.000
15.500	13.500	21.000	14.500	16.000
20.500	18.000	13.000	12.000	16.000
11.000	17.000	18.500	13.000	14.500
14.500	11.000	13.500	15.000	20.000
13.000	13.500	22.000	17.500	12.000
10.500	13.500	10.000	13.500	15.500
11.000				

MEAN= 14.435
SIGMA= 2.966

```
    10.000
              XXXXXXX
    11.500
              XXXXXXX
    13.000
              XXXXXXXXXXX
    14.500
              XXXXXXX
    16.000
              XXXXXXX
    17.500
              XXX
    19.000
              X
    20.500
              XXX
    22.000
```

LAB. TEST REPORT ICI ATLAS AEROSPACE DIVISION

Dwg/part #	Part name	Test date
176-00110	STAB DELAY PRIMER ASSY	10-1-80
Customer order #	**Atlas order #**	**Lot #**
DAAK21-79-R-9064	1369	1369-001

Sample size	Spec. #	Spec. par.	Spec.	Min:	Max:
50	PER CONTRACT	F.2.4			

High	Low	X̄	K	Sigma	No fire	All fire
24.0	8.5	15.09 ~~15.76~~		3.18 ~~3.19~~		1/4 OZ 4"

Environment: -65°F 2HRS MIN

Environment:

#	Ohms	no fire acc.	no fire rej.	DENT	Time (M SEC'S)	#	Ohms	no fire acc.	no fire rej.	DENT	Time (M SEC'S)
1		✓		.012	12.5	26		✓		.010	14.5
		✓		.009	13.0			✓		.013	14.0
		✓		.009	8.5		DID NOT	FI	RE	M-55	
		✓		.011	23.0			✓		.011	15.5
5		✓		.012	13.0	30		✓		.010	17.5
		✓		.011	12.0			✓		.010	13.0
		✓		.013	12.5			✓		.008	15.0
		✓		.014	15.0			✓		.015	21.0
		✓		.008	10.5			✓		.014	14.5
10		✓		.011	12.0	35		✓		.016	14.0
		✓		.013	13.0			✓		.011	13.5
		✓		.012	17.0			✓		.008	19.5
		✓		.011	14.0			✓		.008	12.5
		✓		.012	17.0			✓		.012	18.0
15		✓		.008	11.0	40		✓		.013	13.5
		✓		.009	13.0			✓		.011	24.0
		✓		.010	20.0			✓		.011	17.0
	DID NOT	F	IRE	MSS				✓		.011	13.5
		✓		.010	17.0			✓		.011	15.0
20		✓		.008	17.0	45		✓		.009	14.5
		✓		.009	17.5			✓		.011	14.0
		✓		.010	17.5			✓		.012	15.0
		✓		.016	14.5		DID NOT	FI	RE	M-55	15.5
		✓		.012	11.0			✓		.010	13.0
25		✓		.013	20.0	50		✓		.007	18.5

PULL TEST		BEND TEST		RESISTANCE		OUTPUT		DUDS	
Sample	Failures	Sample	Failures	Sample	Failures	Sample	Failures	Sample	Failures
						47	0	50	3

MEETS SPEC: Yes [ ] No [X] | Test personnel: Leah Gerber | MEETS SPEC: Yes [ ] No [X]

WITNESSED J. Zinellia DCAS QAR
Government Inspector

J. Federano
Final Inspection Technician

ATL. 6718A

INPUT DATA

12.500	13.000	8.500	23.000	13.000
12.000	12.500	15.000	10.500	12.000
13.000	17.000	14.000	17.000	11.000
13.000	20.000	17.000	17.000	17.500
17.500	14.500	11.000	20.000	14.500
14.000	15.500	17.500	13.000	15.000
21.000	14.500	14.000	13.500	19.500
12.500	18.000	13.500	24.000	17.000
13.500	15.000	14.500	14.000	15.000
15.500	13.000			

MEAN= 15.085
SIGMA= 3.183

```
  8.500
        X
 10.438
        XXXXX
 12.375
        XXXXXXXXXXXXXXXX
 14.313
        XXXXXXXXXX
 16.250
        XXXXXXXXX
 18.188
        XXX
 20.125
        X
 22.063
        XX
 24.000
```

LAB. TEST REPORT — ICI — ATLAS AEROSPACE DIVISION

Dwg/part #	Part name	Test date
176-00110	STAB-DELAY Primer Ass'y	10-1-80
Customer order #	**Atlas order #**	**Lot #**
DAAK21-79-R-9064	1369	1369-001

Sample size	Spec. #	Spec. par.	Spec. Min:	Spec. Max:
50	PER CONTRACT	F, 2, 5		

High	Low	$\overline{X}$	K	Sigma	No fire	All fire 1/4 OZ
20.0	10.0	14.20		2.62		4"

Environment: +150°F 2HRS MIN

Environment:

#	Ohms	no fire acc.	no fire rej.	DENT	Time (M SEC'S)	#	Ohms	no fire acc.	no fire rej.	DENT	Time (M.SEC'S)
1		✓		.012	13.5	26		✓		.013	18.5
		✓		.012	12.4			✓		.012	16.0
		✓		.011	13.5			✓		.010	18.5
		✓		.012	10.0			✓		.010	17.0
5		✓		.012	15.3	30		✓		.014	20.0
		✓		.010	12.0			✓		.012	16.0
		✓		.010	12.5			✓		.012	17.0
		✓		.010	12.5			✓		.012	19.0
		✓		.011	12.0			✓		.012	14.0
10		✓		.013	12.5	35		✓		.011	11.0
		✓		.014	11.5			✓		.012	12.0
		✓		.010	16.0			✓		.013	18.0
		✓		.015	14.0			✓		.015	17.5
		✓		.008	10.0			✓		.006	11.5
15		✓		.008	16.5	40		✓		.010	16.8
		✓		.011	16.0			✓		.008	15.0
		✓		.006	13.0			✓		.011	14.5
	DID NOT	FIRE	M55					✓		.010	15.5
		✓		.008	15.0			✓		.013	12.5
20		✓		.008	13.0	45		✓		.012	14.5
		✓		.013	12.0			✓		.013	17.0
		✓		.012	12.5			✓		.014	18.0
		✓		.013	12.5			✓		.012	12.0
		✓		.015	14.5		DID NOT	FIRE	M-55		
25		✓		.010	13.0	50		✓		.014	10.5

PULL TEST Sample	PULL TEST Failures	BEND TEST Sample	BEND TEST Failures	RESISTANCE Sample	RESISTANCE Failures	OUTPUT Sample	OUTPUT Failures	DUDS Sample	DUDS Failures
						48	0	50	2

MEETS SPEC: Yes ☐ No ☒ — Test personnel: Leah Gerber (signature) — MEETS SPEC: Yes ☐ No ☒

WITNESSED
J. Zuilelis DCAS QAR
Government Inspector

J. Federan (signature)
Final Inspection Technician

ATL. 6118A

INPUT DATA

13.500	12.400	13.500	10.000	15.300
12.000	12.500	12.500	12.000	12.500
11.500	16.000	14.000	10.000	16.500
16.000	13.000	15.000	13.000	12.000
12.500	12.500	14.500	13.000	18.500
10.000	18.500	17.000	20.000	16.000
17.000	19.000	14.000	11.000	12.000
18.000	17.500	11.500	16.500	15.000
14.500	15.500	12.500	14.500	17.000
18.000	12.000	10.500		

```
MEAN=          14.202
SIGMA=           2.623

     10.000
             XXXXX
     11.250
             XXXXXXXX
     12.500
             XXXXXXXXXXX
     13.750
             XXXXX
     15.000
             XXXXXXX
     16.250
             XXXXX
     17.500
             XXXXX
     18.750
             XX
     20.000
```

APPENDIX G.--SURVEY TEST RESULTS

Ambient
Input Cup
Regular Rim-Porn
Press Pin .067
Force 200# DFg.

[illegible] April 1980
ICI UNITED STATES INC.
(Atlas Aerosp[illegible]e Division)

H.D.L. Stab.
Delay Primer

Development Laboratory Report

Date: 1-7-81 & 1-8-81
Proj # RA 1369
Sht 1 of 2

Random Samples taken

#	Oms	Lead Azide RD1333 28 mg	AIA 160-2 8 mg	Space to top	#	Oms	Lead Azide RD1333 28 mg	AIA 160-2 8 mg	Space to top
1	13.94				21	10.54		.032	.012
2	11.66	.109	.032 to .038	.012	22	10.08	.109 to	to	to
3	10.88	to		to	23	10.92	.115	.038	
4	13.82	.115			24	11.68			.019
5	14.26			.019	25	11.34			
6	14.04				26	12.24			
7	8.44	delay			27	13.64			
8	10.94	primers are			28	12.74			
9	11.22	from build			29	13.12			
10	13.92	of 500			30	15.28			
11	14.18	tested with			31	12.42			
12	10.88	V.F. fixture			32	11.84			
13	12.58				33	15.52			
14	15.16				34	12.08			
15	12.34				35	12.32			
16	8.84								
17	11.66								
18	11.70								
19	10.42								
20	10.32								

Continued

TEST BY: M. Murphy

Ambient
Input Cup
Regular Pim Pom
Press Pin .067
Force 200# DFg.

Loaded April ...
ICI UNITED [illegible]TATES INC.
(Atlas Aerosp[illegible]e Division)
H. D.L. Stab
Delay Primer
Development Laboratory Report
Random Samples taken

Date: 1-8-81
Proj # PA 1369
Sht 2 of 2

#	Oms	Lead Azide RD 1333 28 mg	AIA 160-2 8 mg	Space to top
36	13.38			
37	11.64	.109 to .115	.032 to .038	.012 to .019
38	11.66			
39	14.08			
40	11.22			
41	13.46			
42	11.92			
43	13.16			
44	9.96			
45	12.32			
46	13.68			
47	17.10			
48	11.26			
49	13.68			
50	14.42			

$\bar{x} = 12.40$

$s = 1.74$

TEST BY: M. Murphy

INPUT DATA

13.940	11.660	10.880	13.820	14.260
14.040	8.440	10.940	11.220	13.920
14.180	10.880	12.580	15.160	12.340
8.840	11.660	11.700	10.420	10.320
10.540	10.080	10.920	11.680	11.340
12.240	13.640	12.740	13.120	15.280
12.420	11.840	15.520	12.080	12.320
13.380	11.640	11.660	14.060	11.220
13.460	11.920	13.160	9.960	12.320
13.680	17.100	11.260	13.680	14.420

MEAN= 12.398
SIGMA= 1.740

```
 8.440
        XX
 9.523
        XXXXX
10.605
        XXXXXXXXXXXXX
11.688
        XXXXXXXXXXX
12.770
        XXXXXXXX
13.853
        XXXXXXX
14.935
        XXX
16.018
        X
17.100
```

Input Cups Reg. Pim Porn

metal firing pin guide holdown
plastic " " "

ICI UNITED STATES INC.
(Atlas Aerosp Division)

H.D.L Stab.
Delay Primer
Development Laboratory Report

Date: 1-8-81
Proj # PA 1369
Sht 1 of 1

#	Oms	Lead Azide R.D. 1333 28 mg	AIA 160-2 8 mg	Space to top				
1	10.34	.109 to .115	.032 to .038	.012 to .019				
2	10.96							
3	9.24							
4	10.14							
5	10.56							
6	11.24							
7	11.46							
8	8.54							
9	11.14							
10	8.92							

$\bar{x} = 10.25$

$S = 1.03$

TEST BY: M. Murphy

```
INPUT DATA
        10.340        10.960        9.240        10.140        10.560
        11.240        11.460        8.540        11.140         8.920

MEAN=         10.254
SIGMA=          1.031

     8.540
          X
     8.905
          XX
     9.270

     9.635

    10.000
          XX
    10.365
          X
    10.730
          X
    11.095
          XXX
    11.460
```

environ

? put Cup Reg Lim Porn

ICI UNITED STATES INC.
(Atlas Aerosp. Division)

HDL Stab
Delay Primer
Development Laboratory Report

Date: 1-9-81
Proj # PA-1369
Sht 1 of 1

.067 Press Pin 200# DFG.

#	Oms	Lead Azide RD 1333 28 mg	AIA 160-2 8 mg	Space to top	#	Oms	Lead Azide RD 1333 28 mg	AIA 160-2 8 mg	Space to top
		.109/.115	.032/.038	.012/.019			.109/.115	.032/.038	.012/.019
new All metal Firing Pin Guide									
no plastic teflon guide						plastic teflon guide only			
1	7.70 ~~7.70~~				6	15.08			
2	6.96				7	11.06	attempt to simulate torque		
3	7.80				8	9.48			
4	10.34				9	14.22			
5	9.44				10	11.72			

The drop fixture was changed to ensure that the drop weight would exit from the guide tube prior to hitting the firing pin.

TEST BY: M. Murphy

INPUT DATA

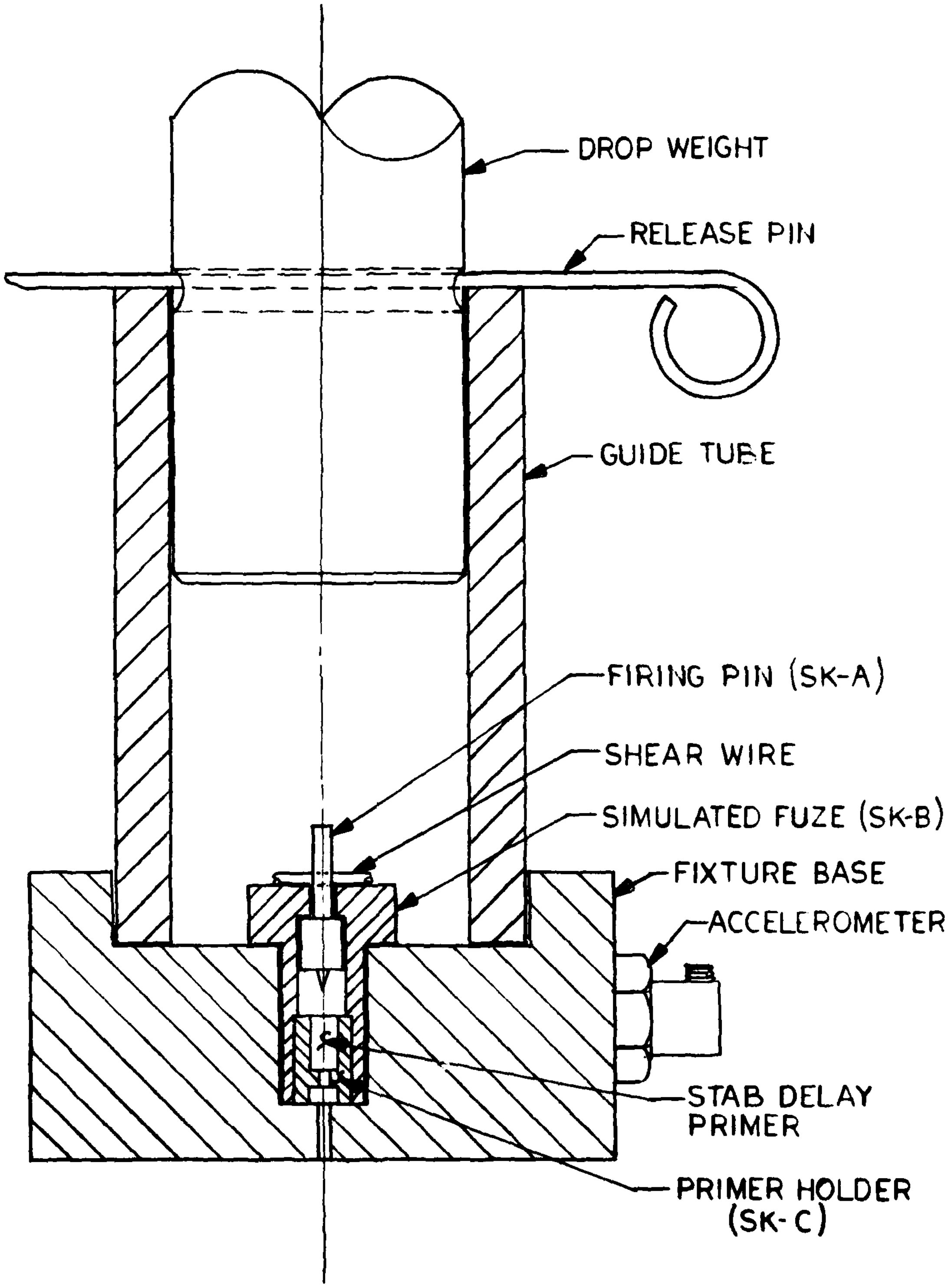
7.700	6.960	7.800	10.340	9.440

MEAN= 8.448
SIGMA= 1.393

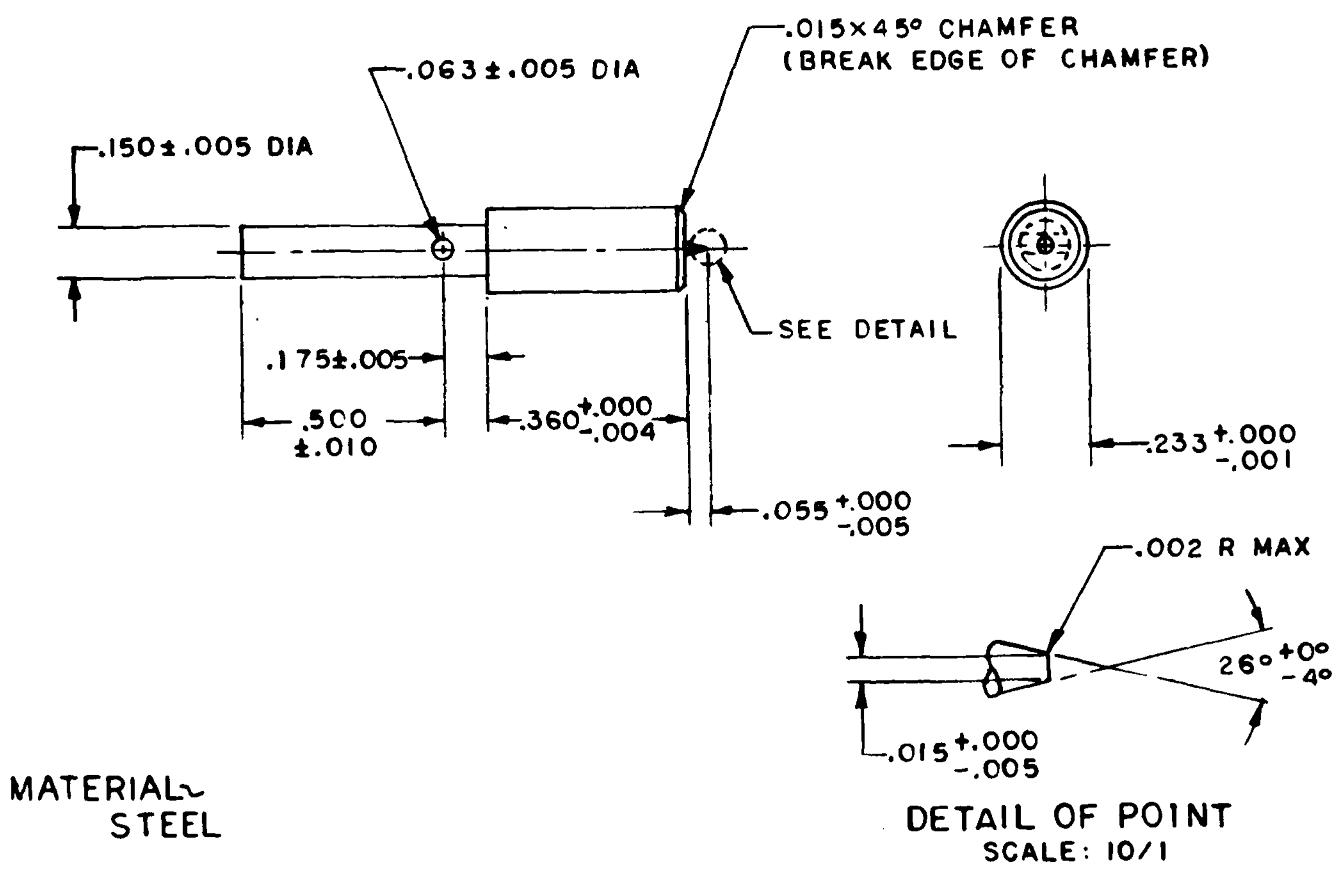
```
   6.960
          X
   7.382
          XX
   7.805

   8.227

   8.650

   9.072
          X
   9.495

   9.917
          X
  10.340
```

```
INPUT DATA
          15.080          11.060          9.480          14.220          11.720

MEAN=          12.312
SIGMA=          2.304

     9.480
          X
    10.180

    10.880
          X
    11.580
          X
    12.280

    12.980

    13.680
          X
    14.380
          X
    15.080
```

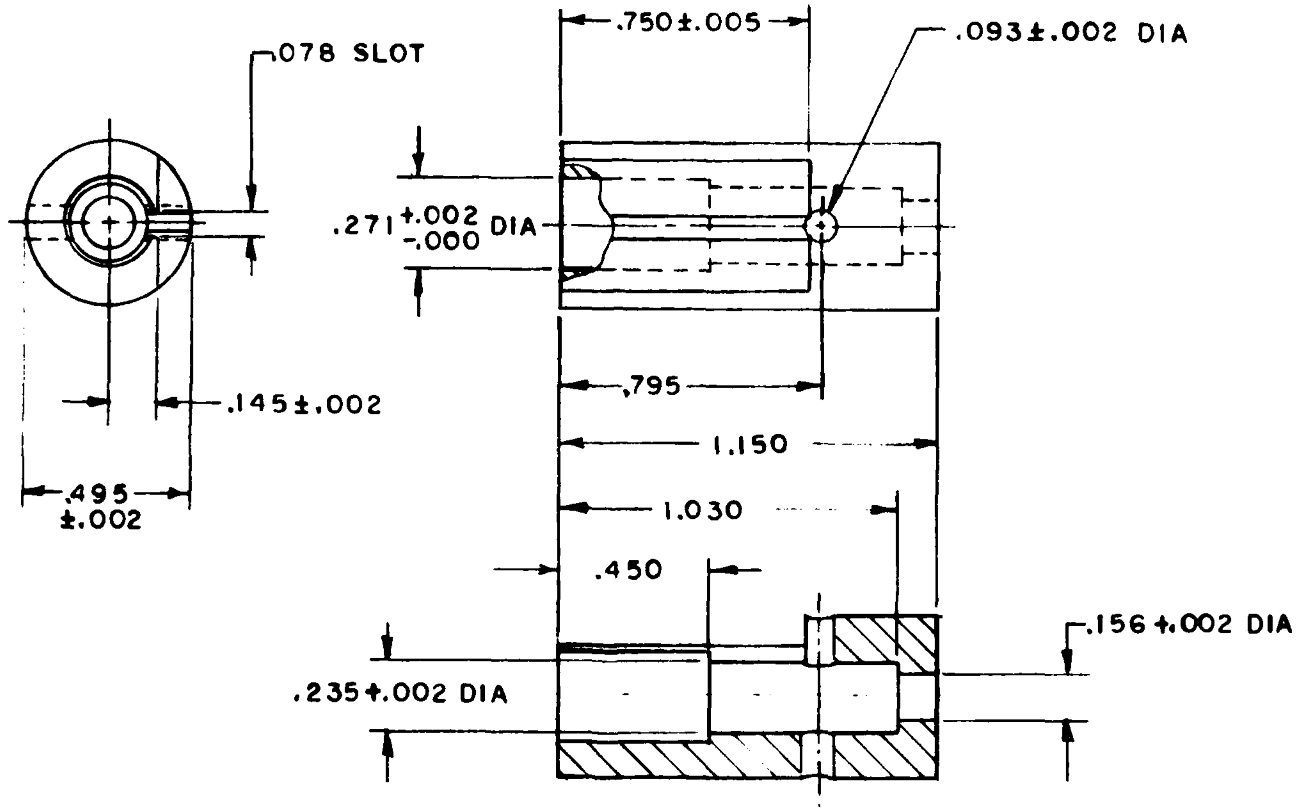
APPENDIX H.--HDL SIMULATED FUZE PRIMER TEST FIXTURE



HDL SIMULATED FUZE PRIMER TEST FIXTURE

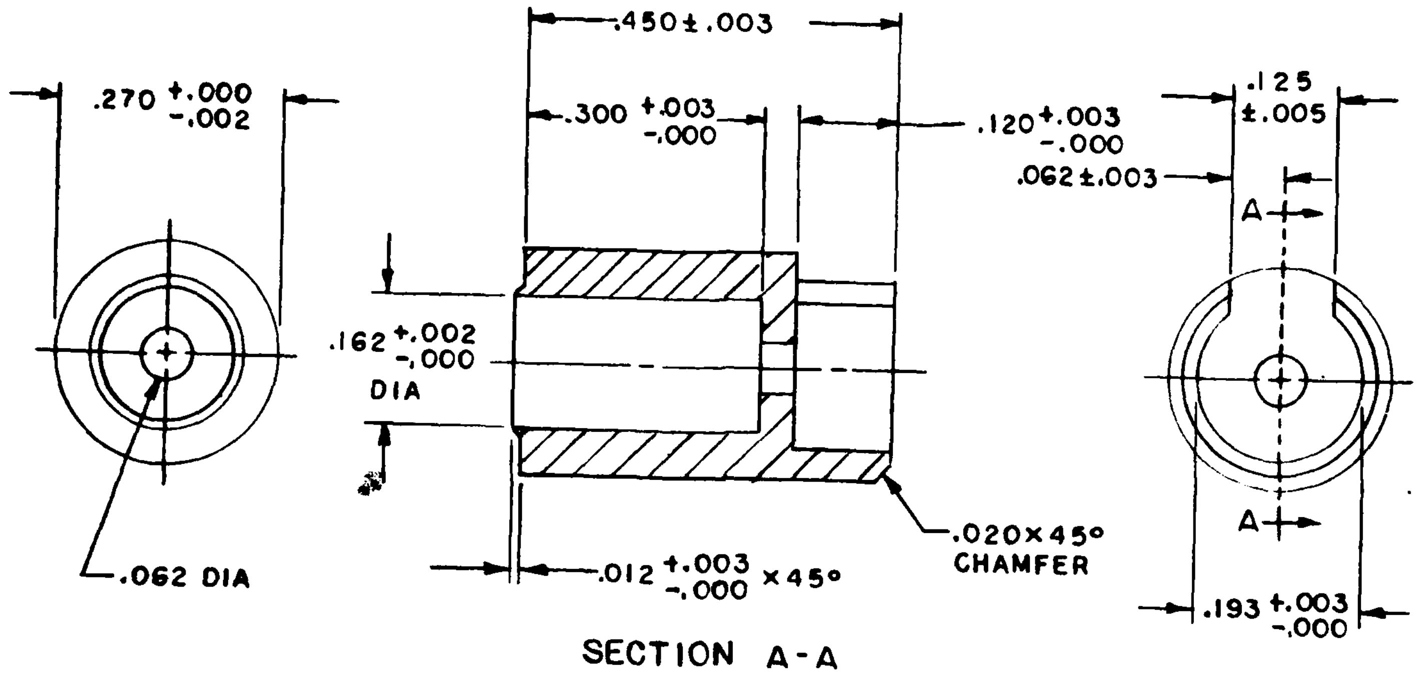


FIRING PIN (SK-A)



NOTES:
1. DIM ±.005 IF NOT MARKED.
2. MAT'L ALUMINUM

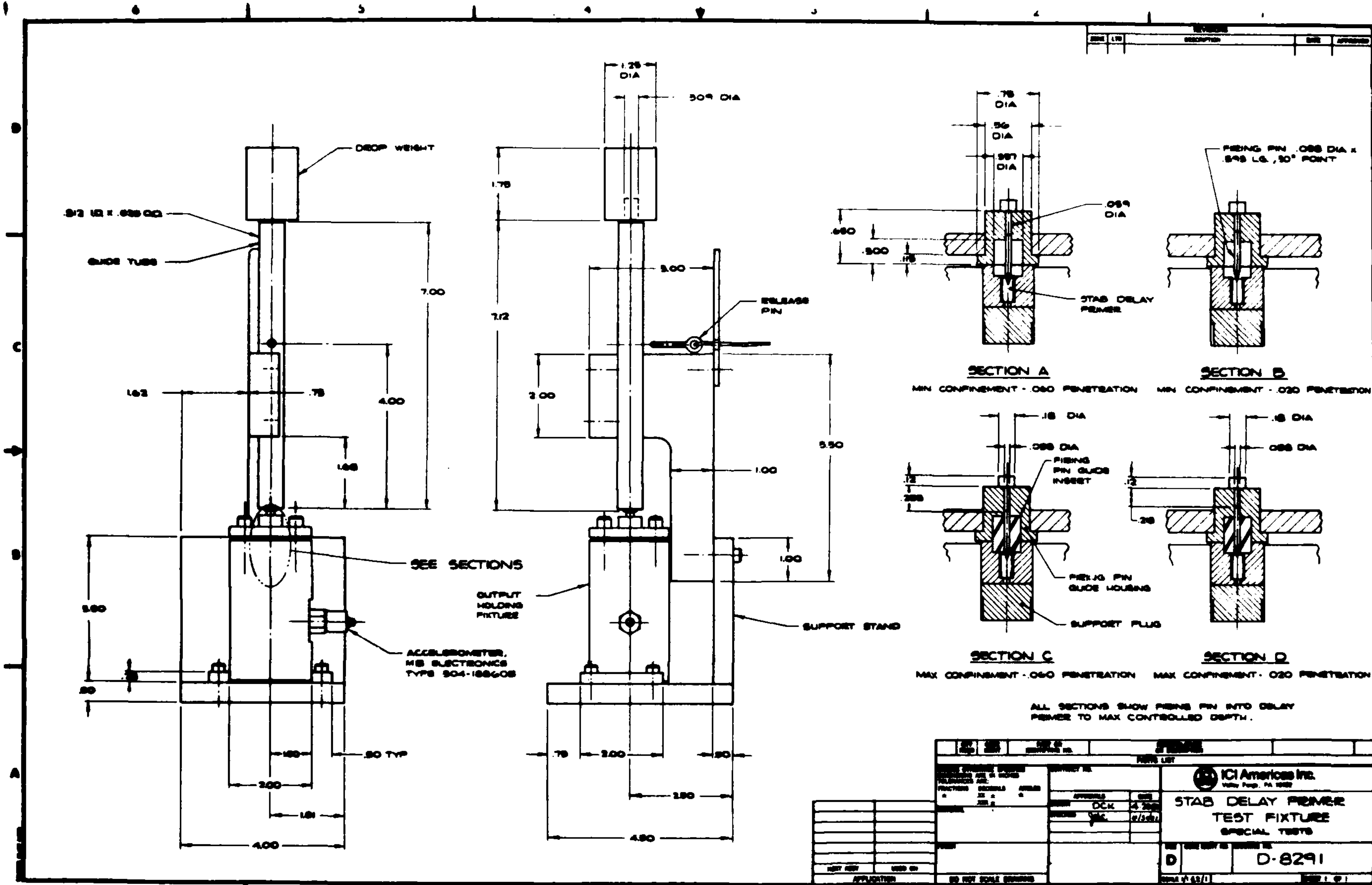
SIMULATED FUZE (SK-B)



NOTES:
1. MIL-A-2550 APPLIES.
2. MATERIAL: ALUMINUM ALLOYS 2011-T3, 2014-T4, 2024, OR 6061-T4 PER ASTM B211.
3. APPLY FINAL PROTECTIVE FINISH NO. 7.3.1 OF MIL-STD-171.

PRIMER HOLDER (SK-C)

APPENDIX I.--ICI FIXTURE--SPECIAL TEST METHODS


DROP WEIGHT
.312 I.D. x .625 O.D.
GUIDE TUBE
SEE SECTIONS
ACCELEROMETER, MB ELECTRONICS TYPE 504-188608
OUTPUT HOLDING FIXTURE
RELEASE PIN
SUPPORT STAND
1.25 DIA
.509 DIA
.50 TYP
SECTION A
MIN CONFINEMENT - .060 PENETRATION
SECTION B
MIN CONFINEMENT - .020 PENETRATION
SECTION C
MAX CONFINEMENT - .060 PENETRATION
SECTION D
MAX CONFINEMENT - .020 PENETRATION
FIRING PIN .088 DIA x .595 LG, 30° POINT
STAB DELAY PRIMER
FIRING PIN GUIDE INSERT
FIRING PIN GUIDE HOUSING
SUPPORT PLUG
ALL SECTIONS SHOW FIRING PIN INTO DELAY PRIMER TO MAX CONTROLLED DEPTH.
ICI Americas Inc.
STAB DELAY PRIMER
TEST FIXTURE
SPECIAL TESTS
D
D-8291
DO NOT SCALE DRAWING
APPLICATION
PARTS LIST
DCK

APPENDIX J.--CONFINEMENT TEST RESULTS

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Simulated Fuze Test Fixture +160°F

	TEST NO.		FUNCTION TIME M-SEC	
	1		8.24	
	2		8.00	
	3		8.13	
	4		9.59	
	5		7.33	
	6		8.65	
	7		INPUT	OUD
	8		7.35	
	9		12.17	
	10		11.32	
	11		8.24	
	12		8.41	
	13		11.68	
	14		11.14	
	15		8.91	

Test by: Brandi / Murphy

12. INPUT DATA

8.240	8.000	8.130	9.590	7.330
8.650	7.350	12.170	11.320	8.240
8.410	11.680	11.140	8.910	

MEAN= 9.226
SIGMA= 1.650

```
 7.330
          XX
 7.733
          XX
 8.137
          XXX
 8.540
          XX
 8.943

 9.347
          X
 9.750

10.153

10.557

10.960
          XX
11.363
          X
11.767
          X
12.170
```

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Simulated Fuze Test Fixture $+70^{\circ}F$

Test No.		Function Time M-SEC
1		8.75
2		9.24
3		10.55
4		9.35
5		10.35
6		12.10
7		9.20
8		9.80
9		8.70
10		9.30
11		9.20
12		8.90
13		10.40
14		9.00
15		10.75

Test by: Brandi / Evans

14. INPUT DATA

8.750	9.240	10.550	9.350	10.350
12.100	9.200	9.800	8.700	9.300
9.200	8.900	10.400	9.000	10.750

MEAN= 9.706
SIGMA= 0.946

```
     8.700
            XXX
     8.983
            XXXX
     9.267
            XX
     9.550
            X
     9.833

    10.117
            X
    10.400
            XX
    10.683
            X
    10.967

    11.250

    11.533

    11.817
            X
    12.100
```

TRACEBACK FOLLOWS ROUTINE ISN XR1 XR2 ARR

STAT

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S[illegible]ulated Fuze Test Fixture -65°F

TEST NO.		FUNCTION TIME M-SEC					
1		17.89					
2		17.20					
3		10.78					
4		10.64					
5		11.67					
6		13.49					
7		9.12					
8		13.52					
9		11.16					
10		10.97					
11		15.06					
12		12.16					
13		11.76					
14		16.22					
15		10.73					

Test by: Brandi / Evans

[illegible]	[illegible]	10.780	10.640	11.670
13.490	9.120	13.520	11.160	10.970
15.060	12.160	11.760	16.220	10.730

```
MEAN=          12.825
SIGMA=          2.652

     9.120
           X
     9.851
    10.582
           XXXXX
    11.312
           XX
    12.043
           X
    12.774
           X
    13.505
           X
    14.236
    14.967
           X
    15.697
           X
    16.428
    17.159
           XX
    17.890
```

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ICT Test Fixture Maximum Confinement - .020 Penetration +70°F

TEST NO.		FUNCTION TIME M-Sec					
1		7.60					
2		7.77					
3		7.83					
4		9.61					
5		9.33					
6		8.62					
7		10.15					
8		9.32					
9		9.10					
10		8.33					
11		8.17					
12		8.41					
13		6.95					
14		8.43					
15		9.22					
16		8.03					
17		9.47					
18		8.46					
19		7.71					
20		7.78					

Test by: Brandi / Evans

7.600	7.770	7.830	9.610	9.330
8.620	10.150	9.320	9.100	8.330
8.170	8.410	6.950	8.430	9.220
8.030	9.470	8.460	7.710	7.780

MEAN= 8.514
SIGMA= 0.823

```
  6.950
         X
  7.217

  7.483
         XX
  7.750
         XXX
  8.017
         XX
  8.283
         XXXX
  8.550
         X
  8.817

  9.083
         XXXX
  9.350
         XX
  9.617

  9.883
         X
 10.150
```

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ICI Test Fixture Minimum Confinement - .020 Penetration +70°F

TEST NO.		FUNCTION TIME M-Sec					
1		12.39					
2		12.65					
3		10.40					
4		10.44					
5		10.69					
6		10.84					
7		9.71					
8		10.56					
9		10.26					
10		11.23					
11		10.54					
12		8.56					
13		9.17					
14		8.95					
15		11.01					
16		8.89					
17		8.09					
18		9.34					
19		8.40					
20		9.06					

Test by: Brandi / Murphy

12.390	12.650	10.400	10.440	10.690
10.840	9.710	10.560	10.260	11.290
10.540	8.560	9.170	8.950	11.010
8.890	8.090	9.340	8.400	9.060

```
MEAN=          10.059
SIGMA=          1.259

     8.090
              XX
     8.470
              X
     8.850
              XXXX
     9.230
              X
     9.610
              X
     9.990
              X
    10.370
              XXXXX
    10.750
              XX
    11.130
              X
    11.510

    11.890

    12.270
              XX
    12.650
```

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Test Fixture Maximum Confinement - .060 Penetration +70°F

TEST NO.		FUNCTION TIME M-SEC					
1		10.08					
2		8.17					
3		7.43					
4		9.26					
5		7.81					
6		6.92					
7		9.05					
8		8.23					
9		10.79					
10		8.55					
11		9.11					
12		9.36					
13		10.98					
14		13.92					
15		8.42					
16		7.15					
17		9.56					
18		10.01					
19		8.97					
20		8.85					

Test by: Brenda Murphy

22. INPUT DATA

10.080	8.170	7.430	9.260	7.810
6.920	9.050	8.290	10.790	8.590
9.110	9.360	10.980	13.920	8.420
7.150	9.560	10.010	8.970	8.850

MEAN= 9.131
SIGMA= 1.576

```
 6.920
        XXX
 7.503
        X
 8.087
        XXXX
 8.670
        XXXX
 9.253
        XXX
 9.837
        XX
10.420
        XX
11.003

11.587

12.170

12.753

13.337
        X
13.920
```

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Test Fixture Minimum Confinement - .060 Penetration +70°F

TEST NO.	FUNCTION TIME M-Sec.
1	8.29
2	7.38
3	8.22
4	9.05
5	9.80
6	9.75
7	8.38
8	10.08
9	10.33
10	8.84
11	10.09
12	10.52
13	11.01
14	7.53
15	8.90
16	7.78
17	8.93
18	9.36
19	8.16
20	9.93

Test by: Brendi Murphy

24. INPUT DATA

8.290	7.380	8.220	9.050	9.800
9.750	8.300	10.080	10.390	8.840
10.090	10.520	11.010	7.530	8.900
7.780	8.930	9.360	8.160	9.930

```
MEAN=         9.116
SIGMA=         1.049

     7.380
          XX
     7.682
          X
     7.985
          XX
     8.287
          XX
     8.590
          X
     8.892
          XXX
     9.195
          X
     9.497
          X
     9.800
          XXXX
    10.102
          X
    10.405
          X
    10.707
          X
    11.010
```

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